

Returning to Play after Concussion: A Phenomenological Study

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ABSTRACT

This study examines and describes athletes' felt sense of readiness returning to play following a concussion. Analyses of the interviews yielded a description of each participant's experiences with concussions.

Descriptions of this phenomenon generated by informants provide a detailed account of the unique issues athletes face when returning to play following a concussion. Participants' descriptions highlight that in order to play, an athlete knows that he/she ought to be emotionally and physically ready to play. However, the athletes in this study believe that there is not an actual test that can "prove" this and that they can choose to lie and/or cheat the tests to return to play while they are still symptomatic. Athletes, parents, coaches, and trainers will benefit from learning to be better educated on the severity of concussions, concussion detection, assessment and the serious health consequences that can result from playing with a concussion.

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CHAPTER ONE- INTRODUCTION

One of the most challenging problems faced by medical personnel responsible for the healthcare of athletes is the assessment and management of sports related concussions (Wojtys, Hovda, Landry, Boland, Lowell, McCrea, & Minkoff, 1999; Kissick & Johnston, 2005). The team physician is often called upon to make a return to play decision based on a brief sideline evaluation and inadequate observations of the athlete (Lovell, Collins, & Bradley, 2004). In addition, return to play decisions are often made in a noisy stadium, court or arena where there is intense pressure from coaches, fans and other players to return the injured athlete as quickly as possible (Lovell et al., 2004). Therefore it is critical that medical personnel have a good understanding of concussion recognition, assessment, and management, and be able to advise safe steps to return the athlete to his or her activity (Kissick & Johnston, 2005). To assist in this task, a number of concussion grading scales have been developed through the years. However, no universal grading system has been determined.

Concussions are traumatic brain injuries that occur from both mild and severe blows to the head (Putukian, Aubry, & McCrory, 2009). Some brain injuries may appear to be mild but research is finding that concussions can have serious, long-term effects, especially repeat brain injuries or cumulative concussions (Putukian, Aubry, & McCrory, 2009). A concussion is typically caused by a severe head trauma during which the brain moves violently within the skull (Ashare, 2009). A concussion may result from a fall in which the head strikes against an object or a moving object strikes the head. However, concussions can occur without an impact to the head.

Concussion is a leading public health problem, with an estimated 1.6 to 3.8 million sport related concussions each year in the United States (Leddy, Sandhu, Sodhi, Baker, & Willer, 2012). The majority of patients with concussion injuries recover within a seven to ten day period (Leddy et al., 2012). Approximately 10% of athletes have persistent signs and symptoms of concussions that go beyond two weeks (Leddy et al., 2012). If symptoms persist beyond the generally accepted time frame of recovery the patient may be diagnosed with a prolonged concussion or post-concussion syndrome (Leddy et al., 2012). In some individuals post concussion symptoms can persist for months to years following injury and may even be permanent and cause disability (Logan, 2010).

Concussions have become a prominent issue in the last ten years (Ashare, 2009). They are one of the most frequently occurring injury events and therefore represent a significant health problem (McLellan & McKinlay, 2011). Concussions are seen more frequently among children and young adults due to their participation in high risk activities such as contact sports (McLellan & McKinlay, 2011). Even though the effects of concussion injuries are usually temporary if managed correctly, research indicates that if concussions are not managed properly they will result in prolonged and complicated recoveries (McLellan & McKinlay, 2011). Continuing to play with persistent concussion symptoms poses an increased risk for further injury and potentially catastrophic brain injury (Bramley, Patrick, Lehman, & Silvis, 2012).

The biggest danger in recognition and management of concussions is that many athletes return too soon. The brain needs time to heal and if it does not get it, the athlete is then exposed to the potential for even greater damage to the brain (Lovell, Iverson,

Collins, Podell, Johnston, Pardini, & Maroon, 2006; Ashare, 2009; Putukian, Aubry, & McCrory, 2009). Rest is very important after a concussion because it helps the brain to heal (Putukian, Aubry, & McCrory, 2009). Ignoring concussion symptoms and trying to “tough it out” will often make symptoms worse. Athletes tend to underreport their symptoms in order to expedite their return to competition (McDaniel & McIntire, 2010). There is a well-defined multi-step process for assessing physical readiness for returning to play but very little to assess psychological readiness (McDaniel & McIntire, 2010). There has been quite a bit of research done on the physical aspects of return to play, but not psychological aspects or the athletes’ experiences. Gaps remain in research inquiry focused specifically on athletes’ description of readiness to play post concussion.

Unlike a broken bone, it is often hard to see the symptoms of a concussion and athletes will lie about their symptoms in an effort to get back on the field in time for the next game (Ashare, 2009). Returning to play too soon increases the risk of a new concussion, more severe post-concussion symptoms, and can even be fatal (Ashare, 2009). Athletes are returning to play before they are mentally and physically ready which can lead to fatal outcomes (Ashare, 2009).

The pathophysiological effects of sport related concussions have been well-documented in the literature (Giza & Hovda, 2001; Bailes & Cantu, 2001; Katayama, Becker, Tramura, & Hovda, 1990), but the psychological and emotional effects of a concussion, and in particular from the athletes’ perspectives, have not been sufficiently addressed in the literature. Understanding the emotional aspects of sustaining a concussion, such as feelings of helplessness and social isolation, can enhance the athletes’ recovery process (Chertok & Martin, 2013).

There is no quick treatment plan in concussion rehabilitation thus leaving the concussed athlete without a defined treatment strategy and an unknown rehabilitation time frame (Chertok & Martin, 2013). The inability of team physicians and athletic therapists to precisely estimate the duration of symptoms, to predict the nature of the symptoms, or provide definitive instructions for effective management can leave the concussed athlete feeling confused, isolated and helpless (Chertok & Martin, 2013). These factors can contribute to a difficult psychological experience for the concussed athlete (Chertok & Martin, 2013).

Due to the lack of visible injury effects of concussions, concussions have been referred to as the “hidden epidemic” (Chertok & Martin, 2013). The brain trauma induced by a concussion rarely produces signs and symptoms that can be identified by CT scans, MRI’s or radiographs leaving the athlete without tangible evidence of a brain injury (Chertok & Martin, 2013).

Coaches, teammates, and even parents may question the realness of the injury, and the concussed athletes may feel pressure to resume sport participation before they are ready (Rosenberg, 1998). Athletes who return to sport before they are ready may play with less focus, intensity, and confidence (Chertok & Martin, 2013). Athletes may be cautious while playing or feel frustrated with the inability to perform to pre injury levels which can limit the athletes’ ability to focus on performance, which can increase the risk for another injury to occur (Williams, 2006).

Purpose and Research Questions

Purpose

The purpose of this phenomenological study is to describe athletes' felt sense of readiness regarding returning to play following a concussion. This study will focus on a particular group of university aged athletes' decision making in return to play and if/how power and pressure influenced when these athletes were cleared to play.

Research Questions

1. What does it mean for athletes to be ready to play post concussion?
2. What behaviours and influences might be active within the athlete's decision making process?
 - a. Are athletes cognitively, psychologically, and mentally ready to return to play after being cleared to play following a concussion?
 - b. Do athletes feel pressure to return to play? (team, coaches, themselves etc)
 - c. Do athletes mask/ hide their physical symptoms (headaches, nausea etc) to return to play sooner?

Rationale for Proposed Study

My interest in this area of research developed during my undergraduate degree in Kinesiology. I am a Student Athletic Trainer and have been for four years working with both the women's soccer and women's basketball team. I completed an independent study with a head athletic therapist at a Canadian university. As a part of this study we conducted baseline concussion tests for all varsity athletes at that university. I have seen first hand the seriousness of concussions and I have seen many athletes return to sport

after being cleared when they aren't ready to play. For instance, after one of my athletes sustained a brain injury and was experiencing signs of a concussion I notified the coach that we needed to wait at least fifteen minutes before allowing the athlete to return to the game to see if symptoms would subside. Immediately after I spoke to the coach the athlete told the coach that she was ready to return and that the team needed her to play immediately. The coach then proceeded to let her return to play disregarding what I had said. Thus, it is important for not only the athlete to have an understanding of concussions but also the coaches.

I have a thorough understanding of the bio-physiological aspects of concussion and its impact on an athlete and I realise I have to be reflexive. Through this research I want to gather a deeper understanding of what athletes experience throughout the process of having a concussion and if improvements can be made to the return to play process.

The present research project was designed to explore gaps in the literature relating to athletes' narrated experiences. We have a well- developed multi-step process for assessing physical readiness for returning to play, but practically no information from athletes relating their own felt sense of readiness with parameters for relating to psychological readiness. Further, there has been quite a lot of research on physical aspects of return to play, but very little connecting narrated athletes' experiences with the return to play process. Concussions are a serious issue and need to be understood more clearly. There is limited research in this area and thus we need to know more.

Insight derived from this phenomenological study may contribute to improvement in return to play guidelines and could contribute to more meaningful, relevant, and dignified concussion management protocols.

CHAPTER TWO- REVIEW OF THE LITERERATURE

This review of the literature will include six sections presenting the current literature in this area: 1) psychology of sport injury 2) pressures faced by athletes to return to play 3) pathophysiology of concussions 4) concussion policies and consensus statements 5) treatments, management and return to play implications and 6) education and knowledge transfer. The first section outlines that injuries not only have physical consequences for the athletes, they can also create psychological problems. The second section examines pressures athletes feel from coaches and teammates to return to sport prematurely and “tough it out”. The third section provides a description of the pathophysiology of concussions and why they are so severe. The fourth section examines the 3rd and 4th international consensus statements on concussion in sport. The fifth section describes the various treatments and return to play implications and a Canadian university’s concussion policy. The sixth section outlines the importance of concussion education and knowledge transfer.

Psychology of Sport Injury

Injuries not only have physical consequences for the athlete there may also be psychological problems associated with having an injury. The injury may have an impact on the emotional and mental status of the athlete (Crossman, 2001).

The way athletes react emotionally to injury is important to the personal well being of the athlete and can impact their rehabilitation process (Crossman, 2001). After experiencing an injury an athlete can experience significant emotional distress (Tracey, 2003; Mainwaring, Bisschop, Green, Antoniazzi, Comper, Kristman, Provvidenza, & Richards, 2004). Signs of distress can include frustration, depression, tension, confusion,

and anger (Wagman, & Khelifa, 1996; Mainwaring et al., 2004; Brewer, 2001). Athletes also report increases in fatigue, irritability and mood disturbances (Mainwaring et al., 2004).

Qualitative studies in this area have been able to obtain data on the emotional reactions experienced by athletes with injuries and how those emotions can change during the rehabilitation process (Crossman, 2001). The period following immediately after sport injury has been described as one of emotional distress (Crossman, 2001). Some athletes even experience extreme depression after becoming injured and have gone so far as to attempt or commit suicide (Crossman, 2001). Athletes view the early part of rehabilitation as marked by feelings of anger, confusion, depression, fear and frustration (Crossman, 2001). As rehabilitation nears completion and the athlete can soon return to sport depression and frustration are commonly seen (Crossman, 2001). The need to work with athletes early in the injury recovery process is essential because athletes demonstrate mood disturbances from the initial evaluation of the injury and throughout the rehabilitation process (Tracey, 2003). Coping strategies such as education, goal setting, and social support can help with this recovery process (Tracey, 2003). Qualitative studies have recognized a pattern of negative emotions in response to sustaining an injury in sport, with depression and frustration emerging as consistent themes throughout the rehabilitation process (Crossman, 2001).

Mainwaring et al. (2004) reported that athletes with severe and/or long lasting injuries experienced greater mood disturbance than athletes with less severe injuries. Greater mood disturbances were also seen in athletes who received little information about the injury and the recovery process (Mainwaring, et al., 2004). Factors that can

influence emotional response and recovery include the time of season that athletes are injured as well as their injury history, recovery progress, general level of activity disruption, and their social support (Mainwaring, et al., 2004).

Although sustaining an injury in sport can induce emotional distress, athletes have also reported experiencing personal growth, challenge, and sport performance enhancement as a result of their injuries (Crossman, 2001). Sport injuries can have an overwhelming impact on the emotional functioning of the athlete. Thus attending to the emotional responses of athletes to injury is more likely to result in comprehensive treatment that better serves the physical and psychological aspects of the injured athlete (Crossman, 2001).

Cognitive models like the Kubler-Ross Stages of Grieving have been used to explain the psychological aspects of injury and how the athlete perceives the injury (Wagman, & Khelifa, 1996). Athletes may go through these stages of grieving throughout their recovery process: denial and isolation, anger, bargaining, depression, and acceptance (Wagman, & Khelifa, 1996). Every athlete reacts differently to an injury depending on his or her personality traits, coping mechanisms, and both personal (performance anxiety, social support, extroversion/introversion, self-esteem/motivation) and situational factors (relationship with coaches and characteristics of the injury) (Wagman, & Khelifa, 1996). Thus it is important for athletes and their caregivers to come up with coping strategies such as education about the injury, goal setting, understanding the fear of risk taking and having social support from the team, coaches and family members (Wagman, & Khelifa, 1996). Results from Theodorakis et al. (1997) confirm that incorporating goal setting in the rehabilitation process enhances

rehabilitation results. Thus it is important to address psychological issues in athletic injury rehabilitation.

Most studies looking into the emotional response to and recovery from sport injury have been limited to musculoskeletal injuries (Mainwaring, et al., 2004). Emotional consequences of injury may affect athletes in many areas of their life such as their academics, social life, and their athletic performance (Hutchison, Mainwaring, Comper, Richards, & Bisschop, 2009). Mainwaring et al. (2004) conducted a study focusing on the emotional responses to sports injuries by examining non-musculoskeletal injury, specifically concussions. It was concluded that concussed athletes were not emotionally different from their peers before injury, but they were more depressed and confused after sustaining a concussion (Mainwaring, et al., 2004). The emotional response is similar to, but not necessarily the same as athletes who experienced musculoskeletal injuries because unlike musculoskeletal injuries it is often hard to see the signs of a concussion. Thus, the study concluded that the type of injury is an important factor to consider when examining emotional recovery from sport injury (Mainwaring, et al., 2004) and that the recovery process has to be individualised according to the needs of the athlete.

Pressures

Research studies have revealed that athletes may fear re-injuring themselves after returning to competition, not performing up to pre-injury levels and not being able to meet the demands and expectations of coaches and teammates (Gould, Udry, Bridges, & Beck, 1997; Podlog & Eklund, 2004). It has also been noted that athletes may face

pressure to return to sport or to meet specific return deadlines and may feel isolated or alienated from their teammates or coaches (Bianco, 2001).

Coaches, athletic trainers, and medical practitioners have returned injured athletes to play based primarily on the assessment of physical criteria (Gould, Udry, Bridges, & Beck, 1997). Sport psychology research reveals that athletes may be physically healed and rehabilitated but not necessarily psychologically prepared to return to competition following an injury (Podlog & Eklund, 2004).

Gould et al. (1997) argue that athletes returning from injury may commonly experience concerns and/or difficulties in three psychological areas: competency, autonomy, and relatedness. Self-determination theory is a theory of motivation. It is concerned with supporting our natural or intrinsic tendencies to behave in effective and healthy ways (Ryan & Deci, 2000). The self-determination theory suggests that all individuals have basic needs in these three psychological areas, and that when these needs are met by the environment individuals are more likely to experience enhanced self-motivation, increased well being, and improvement in sport performance (Ryan & Deci, 2000). Athletes returning to their sport have fears and concerns about how their body will be able to handle the demands of the sport, which suggests competency issues may be significant (Bianco, 2001). In addition, knowledge that athletes may receive external pressures to return to sport and that they value freedom from pressure suggests autonomy issues may be relevant (Bianco, 2001; Podlog & Eklund, 2004). Lastly, being aware that injured athletes may often feel a sense of alienation from their friends, teammates and coaches suggest issues of relatedness may also be significant in the return to play transition (Ermler & Thomas, 1990; Hughes & Coakley, 1991).

Thus, from the perspective of the self-determination theory, the success of an athlete returning to play may be dependent on how well the environment meets the athlete's three basic needs (Podlog & Eklund, 2004). From this logic Podlog and Eklund (2004) list seven suggestions for meeting the physical and psychological needs of athletes returning to sport: help establish realistic expectations, develop short term process goals, assist athletes in overcoming return to sport fears and building confidence, provide athlete role models, discuss motivations to return to sport, help ensure the autonomy of the returning athlete, and encourage the continuation of social relationships and contacts.

The main weakness with most concussion grading scales is that they rely on the self-report of athletes who are often times motivated to underreport their symptoms so that they can return to competition prematurely (Echemendia & Cantu, 2003). Many athletes are not aware of the signs and symptoms of concussions or the severity of concussions, or they may feel pressure from coaches, parents/guardians, and teammates to return to play as quickly as possible.

Athletes tend to believe that it shows strength and courage to “tough it out” and play when they are injured (McLellan & McKinlay, 2011). Not only is this belief wrong, it can put athletes at risk of serious injury.

According to Bramley et al. (2012), athletes are more reluctant to notify the coach or trainer of a concussion injury during a championship game as compared to a game that was a non-championship game, indicating the participant may be willing to risk further injury depending on the situation. These findings also suggest that players who have received concussion education are more likely to notify their coach or trainer of a

suspected concussion as compared to athletes with no concussion education (Bramley et al., 2012).

Concussions are hard to identify since the majority of them are mild which makes them difficult to diagnose. Most athletes will mask and lie about symptoms to continue competing (Bramley et al., 2012). Thus, athletes, referees, parents, coaches and health care providers need to be educated in concussion detection, its signs and symptoms, assessment techniques and guidelines of safe return to play (McCrory et al., 2009).

One factor that has changed over the years is the increasing pressure that elite athletes experience in returning to play (Bauman, 2005). This pressure can begin to occur immediately following the injury (Bauman, 2005). Awareness of this increasing pressure is an important consideration for health care providers and sport organizations to ensure that athletes return physically and psychologically ready to play (Bauman, 2005).

Pathophysiology of Concussions

Concussions have become a prominent issue in the last ten years (Ashare, 2009). It is one of the most frequently occurring injury events and therefore represents a significant health problem (McLellan & McKinlay, 2011). Concussions are seen more frequently among and young adults due to their participation in high risk activities such as contact sports (McLellan & McKinlay, 2011). Even though the effects of concussion injuries are usually temporary if managed correctly, research indicates that if concussions are not managed properly they will result in prolonged and complicated recoveries (McLellan & McKinlay, 2011). Continuing to play with persistent concussion symptoms poses an increased risk for further injury and potentially catastrophic brain injury (Bramley, Patrick, Lehman, & Silvis, 2012).

Despite hundreds of studies and years of research, there is no commonly accepted definition of a concussion (Lovell et al., 2004). However, the definition originally posed by the Committee on Head Injury Nomenclature of Neurological Surgeons in 1966 has by far represented the most popular definition (Lovell et al., 2004). Concussions were defined by the committee as “a clinical syndrome characterized by immediate and transient post-traumatic impairment of neural function such as alteration of consciousness, disturbance of vision or equilibrium, etc., due to brain stem dysfunction” (Lovell et al., 2004).

However, many other definitions of concussions have been posed in recent years. For example, the American Academy of Neurology (AAN) defines concussions as “any trauma induced alteration in mental status that may or may not include a loss of consciousness” (Lovell et al., 2004). An important part of this definition is the fact that concussions can occur without the loss of consciousness. One of the biggest mistakes made in diagnosis is that loss of consciousness is a requirement for concussion diagnosis (Kissick & Johnston, 2005). It is well recognized that most concussions do not involve a loss of consciousness and when brief loss of consciousness does occur studies have shown that it does not reflect the severity of the injury (Kissick & Johnston, 2005).

A concussion is a common form of head and brain injury, and can be caused by a direct or indirect hit to the head or body (McCrory et al., 2012). This causes a change in brain function, which results in a variety of symptoms (Putukian, Aubry & McCrory, 2009). Some brain injuries may appear to be mild but research is finding that concussions can have serious, long-term effects, especially repeat brain injuries or cumulative concussions. A concussion is typically caused by a severe head trauma during which the

brain moves violently within the skull (Ashare, 2009). A concussion may result from a fall in which the head strikes against an object or a moving object strikes the head but can also be caused by an indirect hit to the body or head such as a whip lash motion.

Recent research into the metabolic effects of concussion has triggered growing insights into the pathophysiology of concussions (Lovell et al., 2004). According to Johnson (2012), a concussion is a traumatically induced physiological disruption of brain function. These changes that happen during concussions occur at the cellular level (Wojtys et al., 1999). While the brain tissue itself appears completely normal on MRI or CT imaging, the brain cells are not functioning properly (Lovell et al., 2004). After the initial hit that causes the concussion, there is a release of neurotransmitters that cause ions to move in and out of the brain cells abnormally (Lovell et al., 2004). At the same time, there is a decreased blood flow to the brain, limiting the cells' energy supply (Lovell et al., 2004). This is why the brain is so vulnerable when an athlete is concussed. In the minutes to days following a concussion, brain cells remain in a vulnerable state (McCrory et al., 2012). During this time period the brain does not function normally on a temporary basis, and is more vulnerable to a second head injury (McCrory et al., 2012).

Concussions are usually caused by a direct blow to the head or by striking the head against a stationary object (Johnson, 2012). On impact, the brain bumps into the interior of the skull and also impacts on the opposite side, resulting in damaging contusions at two sites in the brain (Ananthaswamy, 2003). This is known as the coup and the contrecoup (Ananthaswamy, 2003). Such injuries, if not treated appropriately, can cause a number of complications and long-term effects such as post-concussion syndrome. Post-concussion syndrome is a collection of symptoms that some people

develop after they have had concussion (Leddy et al., 2012). It is a complication of concussion. Symptoms of post-concussion syndrome can include headache, dizziness, and memory and concentration problems (Leddy et al., 2012).

A concussion creates changes in the brain's chemistry that produces a pathophysiologic cascade rendering cells vulnerable to further injury (Giza & Hovda, 2001). The primary elements of the pathophysiologic cascade following a concussive brain injury include abrupt neuronal depolarization, release of excitatory neurotransmitters, ionic shifts, changes in glucose metabolism, altered cerebral blood flow, and impaired axonal function (Giza & Hovda, 2001). These alterations can be correlated with periods of post concussion vulnerability and with neurobehavioral abnormalities (Giza & Hovda, 2001). The management of concussion is largely devoted to keeping the athlete safe while this supply and demand mismatch resolves in the brain (Lovell et al., 2004). Thus, at this stage rest mentally and physically is imperative to the health of the athlete. Most athletes recover over the course of 1-2 weeks but some athletes may take months to completely recover depending on the severity of the concussion (Leddy et al., 2012). There are a number of factors that seem to influence recovery time including concussion history, age, and gender (Lovell et al., 2004). It is crucial that athletes do not return to play while still experiencing any symptoms of a concussion because it can lead to post concussion syndrome or in extreme cases can lead to further brain injury (Lovell et al., 2004).

A significant complication associated with concussion is brain swelling and increased intracranial pressure (ICP) (Randolph, & Kirkwood, 2009). In addition to brain swelling and increased ICP, many concussion patients experience post concussion

symptoms that can last weeks or months after the injury (Kissick & Johnston, 2005).

A recent study suggests that the developing brain in children is more vulnerable to the effects of widespread damage associated with brain injuries (Duff, 2009). From the time the brain begins to develop in utero until the day we die, the connections among the cells in our brains reorganize in response to our changing needs (Duff, 2009). This dynamic process allows us to adapt to brain injuries. Neuroplasticity is the brain's capacity to change and adapt (Duff, 2009). It refers to the physiological changes in the brain that happen as the result of our interactions with our environment (Duff, 2009). Neuroplasticity is a factor in recovery from brain injuries such as concussions (Duff, 2009). However, it has been recently discovered that neuroplasticity is finite.

It is now recognized that there is a spectrum of concussion disorders ranging from acute concussion at one end to various forms of brain degeneration at the other end (Tator, 2014). The spectrum includes concussions, second impact syndrome, post concussion syndrome, depression or anxiety, and chronic traumatic encephalopathy (CTE) (Tator, 2014). Concussion related issues exist in the CFL, NFL and almost all other sport organizations. In recent years, much of the attention to brain problems in football players has focused on a condition known as CTE, which is traced to repeated head blows (Fish, 2012). Researchers believe that one of the causes of CTE is repetitive concussions (Fish, 2012). CTE is known to result in memory impairment, emotional instability, depression and, in some instances, dementia (Fish, 2012). Thus far, CTE can only be diagnosed post-mortem. More information regarding CTE and stories of football players with CTE is located in Appendix K.

Consensus Statements on Concussion in Sport

3rd International Conference on Concussion in Sport

The Clinical Journal of Sports medicine published the Consensus Statement on Concussion in Sport following the 3rd international Conference on Concussion in Sport held November 2008 in Zurich. The Zurich Consensus statement was designed to improve and build on the principles outlined in the original Vienna and Prague conferences and to develop further understanding in concussion evaluation and management using a consensus based approach (McCrory et al., 2009).

Concussion Evaluation

According to the Zurich Consensus Statement (2008), the diagnosis of a concussion involves the assessment of a number of areas including symptoms, physical signs, behaviour, balance, sleep and cognition. A detailed concussion history is also an important part in evaluating a concussion (Appendix A). Diagnosis of a suspected concussion can include any of the following: symptoms (somatic, cognitive, and or emotional symptoms), physical signs (loss of consciousness, amnesia, balance, coordination problems), behavioural changes, cognitive impairment (slow reaction times), and sleep disturbances (McCrory et al., 2009). If any of these components are present a concussion should be suspected and management strategies should be in place.

When a player shows any signs or symptoms of a concussion the player should be evaluated on site and a cervical spine injury should be ruled out (McCrory et al., 2009). Once the first aid issues are ruled out then an assessment of the concussion injury should be made using SCAT 2 or Pocket SCAT 2 (Appendix A)(McCrory et al., 2009). The player should not be left alone in the initial few hours following a concussion and

symptoms should be monitored (McCrory et al., 2009). Once the player is diagnosed with a concussion, he/she should not return to play on the day of the injury. It should also be known that the appearance of symptoms might be delayed for several hours following a concussion (McCrory et al., 2009).

Medical personnel should also evaluate an athlete with a concussion and a medical assessment should be completed (McCrory et al., 2009). The assessment should include a comprehensive history and a detailed neurological examination, which includes an assessment of mental status, cognitive functioning, gait and balance (McCrory et al., 2009). Clinical status of the patient is also necessary including whether or not symptoms have improved or worsened since the injury (McCrory et al., 2009). The points listed above are all included in the SCAT2 assessment.

A number of additional tools may also be used in the diagnosis or exclusion of a concussion injury such as: neuroimaging, objective balance assessment, neuropsychological assessment, and genetic testing (McCrory et al., 2009).

Occasionally, in adult athletes there may be same day return to play. This usually occurs when there is a team physician present who is experienced in concussion management (McCrory et al., 2009).

Concussion Management

The basis of concussion management is physical and cognitive rest until asymptomatic and then a graded program of exertion before being medically cleared to return to play (McCrory et al., 2009). Activities that require concentration and attention (school work, video games, text messaging) may worsen symptoms and potentially delay recovery (McCrory et al., 2009). Most injuries will resolve spontaneously over several

days and these athletes are expected to proceed progressively through a stepwise return to play strategy (Appendix F) (McCrory et al., 2009). In the first stage no activity is permitted. In the second stage light aerobic exercise is allowed. In the third stage sport specific exercise is introduced. In the fourth stage the athlete is able to return to practise with non-contact training drills followed by the fifth stage where full contact is permitted in practise. Finally, in the sixth stage the athlete can return to normal game play. With this stepwise return to play progression the athlete should only continue to the next level if asymptomatic at the current level. Generally, this stepwise progression would take approximately one week with each step taking 24 hours (McCrory et al., 2009). If any post-concussion symptoms occur while in the stepwise progression the athlete should drop back to the previous asymptomatic level and try to progress again after a 24 hour period of rest (McCrory et al., 2009).

Medical personnel are also encouraged to evaluate the concussed athlete for symptoms such as depression, as depression is common among concussed athletes in all levels of traumatic brain injury (McCrory et al., 2009).

Athletes, referees, parents, administrators, coaches, and health care providers must be educated regarding the detection of concussion, its symptoms, assessment techniques, and the principles of safe return to play (McCrory et al., 2009). They play an important role in ensuring these values are implemented on the field of play (McCrory et al., 2009).

The consensus panellists recognize that research is still needed across a wide range of areas in concussion management.

4th International Conference on Concussion in Sport

The Clinical Journal of Sports medicine recently published the Consensus Statement on Concussion in Sport following the 4th international Conference on Concussion in Sport held November 2012 in Zurich. The Zurich Consensus statement was designed to improve and build on the principles outlined in the previous documents and to develop further conceptual understanding of this problem using a formal consensus (McCrory et al., 2012). The science of concussion is evolving, and therefore, management and return to play decisions remain in the realm of clinical judgment on an individualized basis. These are some of the significant elaborations or differences in the Consensus statements to see where the thinking has gone since 2009.

The 4th Consensus Statement is laid out clearly into three sections. The first section is a summary of concussion and its management, with updates from previous meetings. The second section is background information about the meeting process and the third is a summary of specific consensus questions discussed at this current meeting. Also included is the new SCAT 3 assessment tool, the Child SCAT3, and the Concussion Recognition Tool (Appendix J). It was agreed that the SCAT3 would be suitable for adults and youths age 13 and over, while a new tool (Child SCAT3) would be developed for younger children (McCrory et al., 2012).

Majority of concussions will last 7-10 days, although in children and adolescents the recovery time may be longer (McCrory et al., 2012). Physicians should be familiar with return-to-play protocols based upon the 2012 Zurich Consensus Statement on Concussion, which represents a controlled, step-wise return to sport. In paediatric and adolescent student athletes, a corresponding return to learn protocol is an essential prerequisite for

return to play and is an important component of recovery and return to normal activity (Appendix L) (Master, Gioia, Leddy & Grady, 2012). It is important, therefore, for physicians who care for paediatric and adolescent patients with concussion to teach the parent and patient to follow a return to learn plan for families and schools in order to update all of those who care for and work with injured student athletes recovering from concussion (Master et al., 2012). Specific instructions in the form of a prescription for cognitive and physical rest followed by a gradual return to learn plan are essential to help student athletes recover from concussion and make steady progress toward full re-entry into school and return to play and other activities (Master et al., 2012).

Underreporting of concussion is not exclusive to paediatric athletes (Meehan, Taylor & Proctor, 2011). However, paediatric athletic organizations are less likely to have a formal organized approach to concussion management, including preseason balance error scores, computerized neuropsychological testing, and dedicated personnel with concussion training, such as team physicians, athletic trainers, and neuropsychologists (Meehan et al., 2011). This inherent lack of personnel and resources results in further reliance on self-reporting of symptoms in younger athletes, making underreporting more of an issue in paediatrics than in adult sports medicine (Meehan et al., 2011).

Concussions affect the developing brain differently than the fully developed brain (Meehan et al., 2011). The specific effects of concussion on the developing brain are still being elucidated through clinical and scientific investigation (Meehan et al., 2011). As compared with adults, clinicians should expect longer recovery times for younger patients after a concussion. Given the daily cognitive demands placed on school aged athletes,

concussion management in this age group should include, neuropsychological assessment and appropriate academic planning (Meehan et al., 2011). Given the increased vulnerability, ongoing development, and contextual factors that have the potential to complicate recovery from concussion in children, more conservative management is warranted (Meehan et al., 2011).

Concussion Evaluation

Sideline evaluation of concussions is an essential component in the assessment of this injury (McCrory et al., 2012). Neuropsychological tests that assess attention and memory function have been shown to be practical and effective (McCrory et al., 2012). These tests include the SCAT3, which incorporates Maddocks questions, and the Standardized Assessment of Concussion (McCrory et al., 2012). The standard orientation questions (e.g., time, place, person) have been shown to be unreliable in the sporting situation when compared with memory assessment (McCrory et al., 2012). It is also important to recognize that the appearance of symptoms might be delayed several hours after a concussive episode and that concussion should be seen as an evolving injury (McCrory et al., 2012).

Concussion Management

The current published evidence evaluating the effect of rest after a sport related concussion is scarce (McCrory et al., 2012). An initial period of rest following the injury (24-48hours) may be of benefit (McCrory et al., 2012). Additional research to evaluate the long-term results of rest and the optimal amount and type of rest is necessary. Evidence based recommendations include a gradual return to school and social activities before returning to contact sports (McCrory et al., 2012). It was also stated that low-level

exercise for those who are slow to recover might benefit, although the optimal timing after injury of when to initiate this treatment is currently unknown (McCrory et al., 2012). The graduated return to play protocol has not been modified.

An important consideration in return to play is that concussed athletes should not only be symptom free but also should not be taking any pharmaceutical medications that may mask or modify the symptoms of concussion (McCrory et al., 2012).

The value of knowledge transfer as part of concussion education is becoming recognized (McCrory et al., 2012). Target audiences benefit from specific learning strategies, tools do exist but their effectiveness and impact require additional evaluation (McCrory et al., 2012). These specific learning strategies need to be looked into further (McCrory et al., 2012). The media is valuable in bringing attention to concussion, but efforts are needed to ensure that the public is aware of the correct information (McCrory et al., 2012).

Concussion Treatment, Management and Return to Play Implications

During the past 30 years, over 20 concussion management guidelines have been published with the intent of providing guidance and direction for the sports medicine practitioner in making complex return to play decisions (Lovell et al., 2004). There are grading scales that accompany each of these guidelines to determine the severity of the injury as well as the appropriate return to play protocol (Lovell et al., 2004). Although these guidelines have no doubt resulted in improved care of the athlete, these multiple guidelines also create confusion and spark various debates about which is better than the other (Lovell et al., 2004).

Lovell et al (2004) provided a brief review of four of the most popular guidelines as seen in Appendix C. The original Cantu guidelines allowed return to play the day of injury if the athlete was symptom-free both at rest and following physical exertion. However, for those athletes who experienced a loss of consciousness (grade 3 concussion), 1 month before return to play was recommended (Lovell et al., 2004). Cantu's revised guidelines emphasise the duration of symptoms post concussion in grading the severity of the concussion and making return to play decisions.

In 2002, under the auspices of the Federation Internationale de Football Association in conjunction with the International Olympic Committee and the International Ice Hockey Federation an important development regarding concussion management took place in Vienna. An important conclusion of this meeting was that to date no concussion management guidelines were sufficient in assuring proper management of every concussion. The importance of neuropsychological testing as a key element in determining management and return to play decisions of a concussion was emphasized (Lovell et al., 2004). The use of baseline neuropsychological testing is highly recommended in all athletes who are at risk of receiving a concussion (Lovell et al., 2004). In addition, an improved return to play protocol was emphasised (Appendix D) (Lovell et al., 2004). It was specifically recommended that each step would be separated by 24 hours and if any symptoms returned the athlete would drop back to the previous step.

Wojtys et al. (1999), highlight the importance of baseline neuropsychological testing in detecting concussions and managing appropriate return to play. These test instruments are sensitive to even subtle changes in attention, concentration, memory,

information processing and coordination. Neuropsychologic testing provides information on the athletes' functional status (Wojtys et al., 1999; Lovell et al., 2004). However, traditional tests can take hours and are not time effective in evaluating large groups of athletes and are costly. Nonetheless, the usefulness and benefits of these tests should not be taken lightly (Wojtys et al., 1999).

According to Kissick and Johnston (2005), an easy way to think of concussion management is the four R's: recognition, response, rehabilitation, and return.

Recognition

Perhaps the most challenging aspect of managing sport-related concussion is recognizing the injury, especially in athletes with no obvious signs that a concussion has occurred. One of the biggest mistakes made in diagnosis, as mentioned earlier, is the assumption that loss of consciousness is a requirement for concussion diagnosis (Kissick & Johnston, 2005). It is well recognised that most concussions do not involve loss of consciousness, and studies have shown that a brief loss of consciousness has not been found to reflect injury severity or performance on neuropsychological testing post injury (Grindel, Lovell, & Collins, 2001; Collie, Maruff, Makdissi, McCrory, McStephen, & Darby, 2003; Collins, Field, Lovell, Iverson, Johnston, Maroon, & Fu, 2003; Collins, Iverson, Lovell, McKeag, Norwig, & Maroon, 2003; Collie, Maruff, Makdissi, McStephen, Darby, & McCrory, 2004).

Signs and symptoms following a concussion can be physical, cognitive, or emotional (Kissick & Johnston, 2005). Although many are obvious, some are more subtle, such as the sensation of feeling dazed or just not feeling right (Kissick & Johnston, 2005). Therefore, it is very important for trainers working with the athletes at

the sideline, to have a heightened awareness of all symptoms that are consistent with concussions.

Response

Any athlete who is suspected of having a concussion should be removed from the game or practise immediately. Return to play while still symptomatic greatly increases the risk of more severe post concussive symptoms and a longer recovery time (Kissick & Johnston, 2005).

Rehabilitation

Rest is a key aspect in concussion rehabilitation. Rest refers not only to discontinuing sport specific activities, but also to fitness activity, aerobic activity, and certain activities of daily living that increase heart rate (Kissick & Johnston, 2005). Current guidelines recommend a period of cognitive and physical rest in the early post injury period because symptoms can increase with cognitive and physical exertion (Leddy et al., 2012).

Once athletes are completely asymptomatic they may progress to a step wise return to play protocol: *Step-Wise Return to Play Protocol* (Kissick & Johnston, 2005).

Step 1: No activity, complete rest (exertional and cognitive)

Step 2: Light aerobic exercise such as walking or stationary cycling, no resistance training

Step 3: Sport- specific training

Step 4: Non contact training drill

Step 5: Full contact training after medical clearance

Step 6: Game play

The athlete should progress to the next step only if completely asymptomatic at the current step. Each step should take a minimum of one day. If any symptoms are experienced, the athlete should drop back to the previous asymptomatic level and try to progress again after 24 hours.

Return

The athlete who has progressed through the step-wise return to play protocol and is asymptomatic is ready to return to sport participation (Kissick & Johnston, 2005). Many athletes will have a difficult time with this seemingly slow progression and will want return to play prematurely (Kissick & Johnston, 2005). As Johnston et al (2004) state, “within the context of concussion, we (and the athlete) are left to wonder why an investment of 4 months to rehabilitate a high ankle sprain is considered acceptable, whereas 4 months for brain rehabilitation is considered untoward!” (p. 431). Thus, it is essential to provide the athlete with proper education, support and encouragement to help them safely return to their sport (Kissick & Johnston, 2005).

Early detection of concussion is critical to the health of the athlete. Returning the athlete to competition while the brain still needs time to recover can be detrimental (McDaniel & McIntire, 2010). If an athlete returns too quickly to competition after a concussion there is a high chance of brain damage or even in extreme cases death if another concussion is sustained (McDaniel & McIntire, 2010). It can also lead to impairment of cognitive processes, mood, and behaviour (Wojtys et al., 1999). Second impact syndrome is rare, but can occur when a person who is recovering from a concussion receives another one (McDaniel & McIntire, 2010). Second impact syndrome

is responsible for approximately 40 deaths in the last decade (McDaniel & McIntire, 2010).

Decision making for returning to play is often confusing and can lead to uncertainty in decision making (D'Hemecourt, 2011). This is because of the nature of sports related concussion and the subtleness of signs and symptoms. There are three major categories of concern when deciding to return an athlete to competition: second impact syndrome (SIS), post-concussion syndrome, and chronic traumatic encephalopathy (CTE) (D'Hemecourt, 2011).

The SIS is a devastating injury with a mortality rate of at least 50% and nearly a 100% morbidity rate (Cantu, 2009). SIS is caused by a rapid loss of cerebral autoregulation with massive intracerebral swelling (Cantu, 2009). Although some controversy exists regarding SIS, most authorities concur that an initial incident precedes the catastrophic second event and is marked by incomplete recovery from the initial concussion (Cantu, 2009).

The second category of concern relates to the possibility of prolonged recovery from the initial concussion or subsequent concussions known as post concussion syndrome (Lovell et al., 2004). Some athletes may be removed from the competitive season, and those athletes with prolonged and persistent symptoms may need to be removed from their sport entirely (Lovell et al., 2004).

The last area of concern is CTE or Chronic Traumatic Encephalopathy that may result from the cumulative effects of repeated traumatic brain injury (D'Hemecourt, 2011). It involves trauma to areas of the brain that results in loss of intellect, memory, balance, and behavioural changes and can result in symptoms similar to those of

Parkinson's disease (D'Hemecourt, 2011). Symptoms usually present several years after concussive injuries.

Researchers are starting to understand the long-term effects that athletes may suffer from repeated sport-related concussions (Sedney, Orphanos & Bailes, 2011). This raises the question of when to remove an athlete from the competitive season or recommend permanent retirement from competition (Sedney, Orphanos & Bailes, 2011). As with other concussion management decisions, this needs to be individualized, and many factors need to be taken into consideration (Sedney, Orphanos & Bailes, 2011). Social pressure from family, coaches, agents, and teammates may drive the athlete to return to play despite persistent symptoms, thereby increasing the athlete's risk of concussion and potential for persistent disability (Sedney, Orphanos & Bailes, 2011). While making a decision on retiring an athlete, it is a sports clinician's responsibility to include the athletes in the decision making process and provide them with all information about their medical condition (Sedney, Orphanos & Bailes, 2011).

Despite research into the management of concussion, the return to play decision remains one of the most difficult and controversial in clinical sports medicine (Doolan, Day, Maerlender, Goforth & Brolinson, 2011). The literature is often unclear and contradictory regarding specific diagnostic and therapeutic approaches (Doolan et al., 2011).

One Canadian University's Concussion Policy

Currently, there is not one policy that all Canadian universities follow. Each school has different testing protocols, and the doctors even have individual return to sport time frames.

This particular Canadian university's policy for concussion management has changed several times over the years. When a varsity athlete experiences a brain injury there are a few on site tests that a trainer will go through with the athlete such as signs and symptoms, balance tests, and sideline concussion tests. There are many signs and symptoms that are associated with concussion. A concussion should be suspected if one or more of the following are present: headache, dizziness, nausea, vomiting, visual disturbances, ringing in the ears, confusion, amnesia, disorientation, decreased concentration, memory disturbances, decreased coordination, decreased balance, slurred speech, behaviour changes, decreased performance, or decreased playing ability (Lovell et al., 2006). The appearance of these symptoms may be delayed for several hours following a concussion injury.

If symptoms disappear within approximately 15 minutes, the athlete can return to play. If symptoms last longer the athlete should not return to play until they are cleared by a sports medicine physician. This must be treated with caution because it relies on the self-report of athletes who are oftentimes motivated to underreport or mask symptoms in order to return to play prematurely (Echemendia & Cantu, 2003). Once the athlete is symptom free they perform a concussion test which is compared to the athlete's baseline scores. Baseline scores are determined before the start of the season. If the athlete does not score within a small range of their baseline scores they are unable to return to play. However, lines have been blurred in previous years as the athlete was expected to wait a week without symptoms before seeing a sport physician. Now as soon as symptoms are gone athletes can see a sport physician. If the athlete can pass the physician's tests he/she can see the team athletic therapist for clearance to start the return to play protocol.

The athletic therapists at this university have selected a new method of assessing and managing concussions. Since 2012 this university's concussion policy no longer uses baseline concussion testing. Instead athletes who are suspected of having a concussion must see a doctor, specifically a sports medicine specialist. The university's concussion management protocol for determining if an athlete has a concussion is located in Appendix E. If the concussion is severe athletes are to be taken to the hospital immediately. The sports medicine specialist will decide if further testing is needed (CT scan). Once asymptomatic for at least 24 hours then the athlete may begin Step 1 of the return to play guideline (Appendix B). The athlete must wait 24 hours in between each step. If symptoms return the athlete must go back to the previous step until symptoms subside for 24 hours. Athletic trainers and athletic therapists monitor steps 1 through 4. Before continuing to Step 5 the athlete must return to see the sports medicine specialist to be cleared to begin drills with body contact and to return to play.

Education and Knowledge Transfer

Research has revealed that coaches didn't want their players to get assessed after a brain injury for fear that they might be declared as concussed and advised not to play, and that the players didn't want to be assessed for a concussion in case they were declared as concussed since it would limit their playing time (Echlin, 2012). The objective of Echlin's study was to measure the incidence of concussion (scaled relative to number of athlete exposures) and recurrent concussion within two teams of fourth-tier junior ice hockey players between the ages of 16-21 during one regular season (Echlin, 2012). A prospective cohort study called the Hockey Concussion Education Project was conducted during one junior ice hockey regular season from two teams (Echlin, 2012).

Prior to the start of the season, every player underwent baseline assessments using the Sport Concussion Assessment Tool (SCAT2) and the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT). Each regular season game was observed by a qualified physician and at least one other neutral non-physician observer. Players who suffered a suspected concussion were evaluated at the game. If a concussion diagnosis was made, the player was subsequently examined in the physician's office for a full clinical evaluation and the SCAT2 and ImPACT were repeated. Based on these evaluations, players were counselled on the decision of when to return to play. The Hockey Concussion Education Project demonstrated the underreporting of concussion, which was 7 times greater than had previously been reported in the literature. The 2011-2012 Hockey Concussion Evaluation Education Project revealed that young athletes will make decisions based on the adult who they perceive to have the most influence on their success (amount of playing time) and thus wish to please them. In order to improve concussion prevention and management, the coach is central to potential change.

The most critical change that needs to be made is education of players and coaches. They do not understand the risks of playing with a concussion (Echlin, 2012). In the heat of the game coaches may not have the best interests of their players in mind (Echlin, 2012). Players and coaches will downplay symptoms in order to get back into action. There is a lot of old culture in hockey that says, “be tough” or “get back in there, the team needs you” (Echlin, 2012).

According to Echlin (2012), the independent physician observers were empathetic toward the athletes’ desire to play and initially were very cautious about making the decision to diagnose and restrict a player secondary to a concussion diagnosis. The team

physician's first duty is to protect the patient/athlete by providing independent medical care focused solely on their short and long term health (Echlin, 2012). The struggle with this is team related bias that occurs because of relationships that develop between the physician, players/trainers/coaches, and team administrators (Echlin, 2012). The team physicians often experience both bias and social pressures when determining diagnosis and return to play decisions and can experience feelings of guilt (Echlin, 2012).

The reluctance of athletes to self-report a possible concussion is a major obstacle to concussion identification (Echlin, 2012). This reluctance to report is often a result of their fear of losing playing time during their recovery process (Echlin, 2012). Echlin (2012), states the priority of parents to protect their child's long term health can sometimes be overlooked as parents weigh the developmental values associated with sport and their children's accomplishments and achievements. Some children were fortunate to have parents that took it upon themselves to protect their child's health and were not intimidated by the hockey culture (Echlin, 2012).

The pressure to win the next period, game, or series is an important and overriding factor that blinds many of those who are responsible for protecting the health of our young athletes (Echlin, 2012). This philosophy is dangerous when athletes use it to not admit to a concussion.

Despite significant efforts to educate teams and improve their care, Echlin's study suggests that no matter the concussion return to play protocol and diagnosis, when it comes down to an important game, the player will want to return and the coach will still return the athlete to play immediately after a concussion (Echlin, 2012). Education is vital to decrease the incidence of concussion and is also important to change these

attitudes and improve treatments (Echlin, 2012). Education and positive action are everyone's responsibility. The priority must be placed on the short and long term health of each individual athlete over the outcome of any particular game or practise (Echlin, 2012). Concussions can no longer be treated with the casual attitude that has been demonstrated in the past (Echlin, 2012). Echlin (2012) has shown that a consistent management and evaluation protocol is necessary but as Echlin (2012) has suggested through his study they may want these protocols but when it comes down to following these steps athletes, trainers, physicians, and coaches are unwilling when it comes to abiding by these protocols.

CHAPTER THREE- DESIGN AND METHODS

Overall Approach and Rationale

The motivation for this particular study draws from my own experiences within the athletic environment as a student athletic trainer. Within the research process it is important to acknowledge this personal connection, since my experience as a student athletic trainer will influence my stance as a researcher. The final product emerging from the data collection and analysis process is embedded within my project. This research presents information highlighting the significance and meaning of athletes experiencing a concussion and deciding to return to play. My interpretation of the information gathered through my interaction with athletes and my subsequent levels of data analyses were influenced by my philosophical assumptions, worldview and the characteristics of qualitative research. I discuss the processes I undertook to ameliorate this influence in my section on trustworthiness.

Epistemology guides my philosophical beliefs on the nature of research. Epistemology guides beliefs about how I am able to know what I know through a closeness established between researcher and informants/context of interest (Creswell, 2007). Through research conducted in interaction with informants, I am able to gain information to assist in developing a deeper understanding of the meaning of their experience.

Beyond the influence of my philosophical beliefs, this process flowed from the assumptions of my worldview. A worldview is a set of beliefs that guides action and decisions as I conduct my research (Creswell, 2007). Interpretive and post-positivist worldview guided my philosophical beliefs on the nature of research. Interpretivism is

the worldview that shaped the direction of this study seeking to understand the meaning of the world through the information shared by participants (Creswell, 2007). This understanding is not only shaped by the informants' perspectives, but my own background will influence the interpretation and overall outcome of this study as well (Creswell, 2007). The goal of interpretive research is to gain an understanding of a particular situation or context and is much more than the discovery of universal laws or rules (Burrell, & Morgan, 1979; Frisby, 1995; Crotty, 1998; Alvesson, & Deetz, 2000; Rossman, & Rallis, 2003). Individuals/groups build their own understanding of the world through experience. This worldview seeks to explain the stability of behaviour from the individual's viewpoint. Thus, interpretivists look for understanding of a particular context. On the other hand post-positivist worldview seeks to explain so that we can improve effectiveness and efficiency, in order to assist program planners, policy makers, managers, coaches, and others to make objective decisions (Alvesson, & Deetz, 2000). In the case of this study, the desired outcome was to arrive at a deeper understanding of an athlete's felt sense of readiness returning to play following a concussion. Focusing on decision making in return to play and how power and pressure can influence when an athlete is cleared to play.

An additional quality associated with qualitative research acknowledges the role of the researcher in the process (Creswell, 2007). As the primary researcher in this study, I played a key role in the process and overall outcome.

My philosophical beliefs were used to guide the direction of the study and assisted in selecting the methods used for data collection and data analysis (Patton, 1990).

The methods of data collection were used to yield insight into participants' meanings of their experiences in the context of interest (Creswell, 2007). I was able to engage in a direct and personal interaction with the members of a particular group of interest.

Qualitative research investigates complex phenomena and seeks to describe and analyze rather than measure and prescribe. By using qualitative methods, according to Patton (2002), there will be a wealth of in-depth and detailed information that will allow for a more holistic perspective on the complex phenomenon being investigated.

The language of the research question guides the particular approach to the research process that is best suited to developing a deeper understanding of athletes who have experienced a concussion. As stated in the introduction, the purpose of this study is to describe athletes felt sense of readiness returning to play following a concussion. This study will focus on decision making in return to play and how power and pressure can influence when an athlete is cleared to play.

In this particular case, the language of the research question points towards phenomenology. Phenomenological research attempts to develop an understanding of a particular experience among members of a particular group. Through the stories and descriptions provided by the participants, the goal of this process was to uncover the essential elements of a particular experience for members of a particular group (Van Manen, 1990).

Van Manen (1990) refers to the method of phenomenology as revealing the essence of a phenomenon through human actions, behaviours, intentions, and experiences in order to understand the fundamental nature of an experience. Phenomenology is

referred to as a human science and aims at gaining a deeper understanding of the meaning of one's everyday experience. The focus is thus on understanding from the perspective of the person or persons being studied as opposed to trying to learn what really is in the world (Willis, 2001).

Interactions with members of a particular group assist in providing a deeper understanding of the meaning associated with the phenomenon of interest. In this case, the phenomenon of interest is returning to play following a concussion. To arrive at this understanding it was necessary for me to interview multiple athletes who had experienced this phenomenon.

Phenomenology is an approach to research concerned with the study of a particular lived experience (Van Manen, 1990). This provides the researcher with initial questions to begin the research process. In the case of this study the starting point dealt with my own personal experiences of concussions within the varsity environment as a student athletic therapist.

I used the collaboration of Moustaka's (1994) structured method of phenomenology as well as Van Manen's approach. Moustaka's (1994) transcendental or psychological phenomenology is focused less on the interpretations of the researcher and more on the description of the experiences of the participants. Van Manen's approach allows the researcher to consider the use of language and its interpretive applications beyond the informant. Balancing Van Manen's and Moustakas' (1994) ideas were good guidelines for this researcher to help maintain a balance between informant description and application to other contexts.

Phenomenological researchers encounter some limitations in the process of developing an understanding of a particular experience (Willis, 2001). The first limitation I have encountered is based on who I am able to approach to gather information. Interviews were the main data collection method used to engage with the description of a particular experience in the athletic environment through conversation and examination of the language that appears in the transcript of each conversation.

Participants must be able to engage in an extensive conversation about an experience within the context of interest. The purpose of this study was to collect data that could lead towards developing a deeper understanding of a particular experience in a particular context. In this study the particular experience was experiencing a concussion and the particular context was the varsity sport environment. Participants had to have experienced the phenomenon of a concussion in order to participate and had to be a member of a varsity sport. If an individual had not been exposed to the particular experience in the particular context, then they would not be able to participate. Participants could not describe something that they had not experienced.

Phenomenological research is a reflective- analytic process in the sense that throughout the research process it is necessary to maintain a strong relationship with the topic of interest (Van Manen, 1990). In this case, it allowed me to reflect upon my own experiences as a student athletic trainer. Reflection upon my own experiences with concussions at the varsity level served as the inspiration for the research questions that directed the research process.

Methods

The choices of the methods used in this study were guided by the research question and overall approach to research. The method used to collect data in this study was interviews. The following section serves as an elaboration of why interviews were chosen to collect data for this study.

Interviews served as the method of data collection for this study because they provided the opportunity to engage in an interaction with the participants to gather details associated with their experiences as varsity athletes with a history of concussions. This particular method of data collection is called upon to seek out information about particular aspects of the phenomenon experienced (Kvale, 1996). These aspects are difficult to observe and are solely felt by the athlete. As the ultimate goal of this project was to develop a deeper understanding of the particular experience, interviews presented the best method to arrive at the desired conclusion.

The major assumption associated with the choice of an interview is that it takes into consideration that the perspectives of the members of a particular group are meaningful (Patton, 1990). The choice to conduct interviews was made based on the belief that engaging in a conversation with participants during which they describe their experience would yield a deeper understanding of a particular experience.

Many forms of interviews are available to assist qualitative researchers in achieving their goal to arrive at a deeper understanding. In this study a semi- structured interview was the type of interview used. This allowed for more flexibility than structured interviews in order to get a deeper description of the phenomenon. I developed a general outline of topics of interest from sensitizing concepts in the literature to be

discussed before I began constructing the interview protocol and proceeding to the interview process.

Open-ended questions and probes yield in depth responses about people's experiences, perceptions, opinions, feelings and knowledge (Patton, 2002). The purpose of the interviews was to examine a more in depth description of the participant's experience of having a concussion. The major assumption associated with the interview guide/ semi-structured interview approach is that the participants are considered to be "the experts" on their personal experiences and are able to provide detailed descriptions on a experience of interest (Patton, 1990). In this case, participants that were part of a Canadian university varsity team were asked to share their perspectives on the phenomenon of having a concussion. I will note that interviewing about a past event is necessarily retrospective however most researchers working with interview protocols acknowledge both the limitations and strengths of this reality.

Interviews were held at a location of the participants' choice. Prior to starting the interview itself, each participant was asked to read and sign an informed consent form. Copies of the consent form are provided in Appendix G.

Before starting the interview, participants were reminded that participation was voluntary and if any questions made them feel uncomfortable or they didn't want to respond to a question all they needed to do was notify the interviewer and the interview would be stopped. Interviews were recorded for later transcription.

Recruitment and Participant Selection Criteria

Convenience and purposeful sampling were used to recruit participants. In convenience sampling the subjects are invited based solely on the fact that they are

easiest to recruit for the study and the researcher. Purposive sampling starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suit the purpose. In my area of study purposeful sampling was the appropriate option because I, the researcher targeted a specific sample (OUA athletes who have had concussions) and the information received was intended to benefit that specific population. To avoid conflict of interest, their trainers recruited participants for this study. I asked each student trainer to notify their athletes (with concussion history) about my study and participants who were interested in participating in the study contacted me through email. Once they contacted me I replied to their email and participants were asked to sign a letter of invitation and a consent form (see Appendix G) that included my contact information and were encouraged to email or call if they had any specific questions or concerns. Once this was completed I set up times to meet with each athlete. It was made clear that they were under no obligation to participate. Six participants who have been diagnosed with a concussion were recruited from both varsity women's and men's teams.

Data Analysis

The form of data collected revealed detailed information about the experiences and meanings of concussions, what it means to be ready to play post concussion, and external and internal motivations to return to play. Data from the interviews were recorded then transcribed verbatim using Microsoft Office Word. Listening carefully produced written transcripts, which were printed and read through multiple times. The data analysis process was guided by the combination of Moustakas' and Van Manen's methods for analysing phenomenology. Analysis was done through five stages. In the

first stage each transcript was read question-by-question highlighting revelatory phrases and key words. In the second stage each transcript was broken down into meaning units. Meaning units were broken down based on a change in topic or mood. In the third stage each meaning unit was broken down into specific descriptions. Specific descriptions remain true to the informant. In the fourth stage the specific descriptions were broken down further into general descriptions. General descriptions are for the average person (non specialist) to understand and relate to the research questions. General description were also rearranged into chronological order and simplified for the reader. The fifth and final stage involved reading through each specific and general description to find themes and consolidating patterns that were evident across all interviews. An example of this complex data analysis is located in Appendix I.

Ethical Considerations

All researchers must be aware of ethical considerations when they embark on any research project. Qualitative researchers must pay careful attention to the ethical procedures as they engage in the process of data collection.

The first major ethical consideration for this study was briefly mentioned in the section that outlined the rationale guiding the process of recruitment and participant selection. Team trainers contacted the athletes recruited for the study to avoid conflict of interest. Those who were interested in participating in the study contacted me through email and were asked to sign a letter of invitation and a consent form (see Appendix G) that included my contact information and were encouraged to email or call if they had any specific questions or concerns.

Another ethical consideration kept in mind during the entire research process was informed consent. Research participants give the right to informed consent and participants that were interested in participating in this study based on the information provided in the letter of invitation were required to return a signed informed consent form. Participants were informed of any potential physical, psychological or social risks related to participation in the study. After the participants were informed of the risks and consequences, participants had the right to decline.

Participants were informed via the letter of invitation and consent form, that they could refuse participation at any time during this study. I, the researcher, also emphasized this information by verbally addressing the participants as well the fact that withdrawal at any time would not result in any negative consequences. Before beginning the interview I answered any questions the participants had. It was also stressed that the participant could, at any time, refuse to participate without any form of penalty.

Confidentiality represented an ethical issue that I kept in mind throughout the research process. The interviews yielded private stories and descriptions that possessed specific identifying features of the participants; I assured all participants that I would protect their identity. In the case of this study, confidentiality was assured by using aliases to protect their anonymity and their data was analyzed with these aliases. During the data collection the interviews were conducted in a small meeting room (or a location of their choice). Participants were informed of this location prior to their interview. During the interview a note was posted on the door with a request not to be disturbed as a meeting was in progress. Interviewees were given an alias and all data collected was not shared with anyone except the researchers working on the project. Participants will not be

identified in any way should findings be published. Once the study has been completed the data will be destroyed.

All data involved in the study were put in a password-protected computer. All written data were transferred to a data stick, which will be wiped upon completion of the project. Only researchers working on this project had access to these data.

Along with the ethical considerations, I also considered how I would approach the research process in a trustworthy manner. According to Lincoln and Guba (1985), the criteria for assessing trustworthiness are credibility, transferability, dependability, and confirmability. Credibility refers to whether the research findings represent a “credible” theoretical interpretation of the data drawn from the participants’ original data, that is, the ‘believability’ of the findings. Credibility is improved through using verbatim transcripts, checking with informants, re-reading the data sets and providing clear descriptions of all steps of the analysis process along with examples of each step from the raw data. Using the language of the participants also increases credibility. Transferability refers to the degree to which the findings of an inquiry can pertain or transfer beyond the boundaries of the project. This is a practical question that cannot be answered by the researcher alone. Readers of the project, other than the researcher, make the determination about its transferability. Readers will be helped in a decision about transferability if they have access to the steps taken by the researcher and a rich description of all the processes involved in the inquiry. Also helpful will be a rich description of the informants and their contexts so that other readers can decide if the participants and contexts are similar to their own, and whether the findings might be transferred to their own contexts. Again, the more transparent and robust the description of informants, contexts and research

processes, the more likely it will be that the findings will be seen as useful in other contexts. Dependability refers to the inquiry's strengths in internal design that allow readers to be confident that sufficient cross comparison mechanisms in data collection and data analyses were employed. Thus the findings can be seen to be derived inductively from the informants' original data sets and deductively from engagement with sensitizing concepts from the literature and theoretical frameworks as opposed to being based in the researcher's foregone assumptions about the question under study. Triangulation of data collection and/or levels of data analyses, and providing a research audit in the form of an ongoing researcher's journal, contribute to dependability, the ability to depend on the findings being derived from a rigorous process of data collection and analysis.

Triangulation is a powerful technique that facilitates internal cross validation of data collection and analyses. The more clearly these processes are described, the more dependable is the study and its findings. Confirmability refers to how well the inquiry's findings are supported by the data collected and analyzed. Using verbatim quotes, the language of the informants, and providing access to the processes of recursive reduction, either in the body of the work or in appendices, adds to the confirmability. In my study, I have employed all of these aforementioned practices which contribute to trustworthiness.

CHAPTER FOUR- RESULTS

Formal data collection began in January 2013 and continued until March 2013. A total of 6 participants were recruited. The following chapter will be broken down into Specific Descriptions that were created from the Meaning Units. Then I will display the General Descriptions that were broken down from the Specific Descriptions. Following this the Thematising and Consolidating Patterns will be presented. Lastly, the Revelatory Phrases that were found common across all cases will be presented and research questions will be answered. I believe the revelatory phrases consolidate my findings.

Specific Descriptions

Bob Interview

Bob has been playing basketball since grade 6. He has played for a Canadian University for one year as a substitute shooting guard. Bob has had 2 concussions. His first concussion was in October 2012. His second concussion was Feb 12 2013. After experiencing his second concussion he felt frustrated because he knew he was going to sit out again. After his first concussion he didn't know what to do. He thought it was just a headache. He hasn't been as social as he was before the concussions. He keeps to himself and has noticed changes in his mood. He feels lower than he normally feels but blames that on not being able to play basketball, not the actual concussion. He has trouble sleeping and doesn't know if it has to do with the concussion. After the first one he felt ready to play after being cleared because he felt normal. He didn't have symptoms and he felt like his old self.

After he was cleared to play from his first concussion he felt fine and wasn't experiencing symptoms. When he got his second concussion he took himself off and he

didn't play the rest of the game until the very end because the coaches didn't know. The trainer wasn't there when he got put back in the game (he was taking care of another player). Bob knew he was bad but didn't realize he was that bad. He went back in because the coach told him to play and he wasn't going to say no to him.

After the second concussion he did the return to play steps again and got to the point where he was cleared to do contact but the coach wouldn't let him. He still has problems with his vision. His headaches are gone; the wariness feeling is back. He didn't feel pressures from the coaches or teammates to return sooner. After the first one he really wanted to go back in because they were going to Calgary the next week and the coach had basically said that if he wasn't cleared by then, then he wasn't going to Calgary. He got cleared the day before and he thinks that he shouldn't have gone back in. He wasn't apprehensive or nervous when he went back into play in Calgary.

If he were to go back in now he would be timid to drive to the basket like he would normally want to do because he never wants to get hit in the head again. He would be more cautious which he realizes isn't good, which is scary for him. He may have had concussion experiences that were not caught but he has a terrible memory. He probably has had concussions before but nothing like what he has been going through in the last few months.

After a former player on the team who received numerous concussions the team takes concussions really seriously and since he had two within such a short time frame they are being more cautious. If this was his fourth year he would be pissed off about how long it's taking but since it's his first year it's better to be safe than sorry. Bob is frustrated. He can't watch games it's too difficult for him, he hates it. If his team is losing

he feels like he could make a difference. For Bob being ready to play means that you should be symptom free and like with any injury or setback you shouldn't be thinking about it while you are playing.

John Interview

John has been playing basketball since he was 6 years old. He played for a Canadian university for 2½ years as a starter. John has had eight concussions. First concussion was in grade 6. The first one at his university that people know about happened in first year. Symptoms weren't anything crazy. Dizziness, slight headache but he kept playing. He didn't say anything about that concussion because it was his fifth one.

He had to see the doctor about two weeks later for a check up and was diagnosed with a concussion. His next concussion happened in his second year. His final concussion was February 13th 2010 in an away tournament in northern Ontario. He was knocked unconscious and sent to the hospital.

Before his final concussion, having concussions didn't really impact his playing because he would never change the way he played. Once the game started the game took over. He didn't change the way he played so it didn't really have an impact. However, he struggled with the educational aspect of his life. It was difficult for him to concentrate in class. He was getting headaches everyday even to the point of having occasional nosebleeds.

The reason why the last one was so bad was because the Wednesday before the trip to the northern tournament they were playing in a southern tournament, and he got hit in the head and was taken out of the game. The trainers did specific tests on him and

since he had seven concussions prior to this one he was familiar with the test and cheated on the test, which meant the trainers thought he was okay and he was put back into that same game. Fortunately nothing happened during that game.

The main reason way he didn't say anything was because it was getting up to his 7th or 8th concussion and he knew that eventually they were going to stop him from playing. By not saying anything he could continue to play. He considered himself ready to play if the symptoms just went away however he would just play through them anyway.

Until his last concussion where he was no longer able to play basketball, his university didn't actually have a concussion protocol. They would say a week without symptoms but according to John anyone could have symptoms and just lie to be able to play. Since then the university has put in a return to play process.

Since his last concussion it has been an emotional roller coaster. He has been playing basketball since he was six years old and not playing basketball has changed the way he looks at life. Basketball was always a constant in his life; he was always either going to the gym or preparing himself to play. Filling the time has been one of his biggest challenges. Coaching helps even though he didn't even have a choice in the matter. His coach wouldn't allow him to not be involved with basketball. He felt helpless that he wasn't able to help the team by playing. He is slowly coming to terms with the diagnosis. One year after his final concussion he was diagnosed with being severely depressed because he lost a big part of his life and did not know what to do now that it was gone.

For the most part other people's responses (family, teammates, coaching staff) have been positive. They are happy to see him take care of himself. Part of his family and

friends just like him wish he was still playing but they have been extremely supportive throughout the whole process. He has symptoms everyday. He was diagnosed with severe post concussion syndrome. However, things have gotten better. The first five or six months were extremely difficult. He had to be removed from school because he was unable to concentrate in lectures, any sort of brain stimulation would be out of the question. He never experienced any pressures from teammates or coaches to return to play. It was all internalized. If the team wasn't doing well he would assume that he could have made a difference and when they were doing well he wanted to be a part of the team's success.

If he didn't hide his symptoms more of his concussions would have been diagnosed and he would have been forced to stop playing sports a lot sooner. He doesn't regret not saying anything and continuing to play because that's who he is, he can't just sit out. He only regrets doing it because of the outcome. He now realizes the severity of concussions and realizes that he is very lucky and things could have been worse.

Subconsciously the concussion was in the back of his mind while he was playing but the game ultimately took over. For him being ready to play after a concussion was not being dizzy. He could deal with playing with a headache and loud noises but he couldn't deal with the dizziness. There was no way he could play if he was dizzy so that was his own personal clearance to play.

In general for John being cleared to play is being symptom free for at least a week, to be emotionally ready, and physically ready with no symptoms. According to John there is no test that can actually prove this because athletes lie. It's how they are driven. They thrive on competition and wanting to play so there's no true test unless

athletes are 100% truthful. Even the doctors that are doing all the research on concussions can't make the decision of when to return to play because it relies on the athlete and how they portray those symptoms since athletes will lie to return to play sooner.

Zeus Interview

Zeus has been playing rugby since grade 9. He plays for a Canadian university as a starting fly half. He has had four concussions in total and three were from rugby. His most recent concussion was two years ago. His first concussion was three years ago and he had all four concussions within the span of one year. He hasn't had one since the last one. He knew he was ready to go back in because he felt ok. His body and head felt ok but he wasn't "ok'd" by anybody. He was a little bit scared to go back in especially after his second concussion with rugby because of the number of times it happened in such a short time period. The concussion that he had while at university two years ago the head athletic therapist told him yes he was ok to play. There were no tests or procedures done he was just asked how he felt. The paramedics were there when he got his concussion and they advised him to see the doctor but he didn't. He just waited until he felt ok because he saw the doctor for his first concussion while waterskiing and everything felt so similar when he got the concussions in rugby so he just assumed it would be the same thing as before.

He responded emotionally to the concussion by saying that it sucked because he missed practices and a game. His coaches and teammates put pressure on him to return to the game but he didn't care what they thought.

After his last concussion he experienced lingering headaches once he was cleared and blamed it on dehydration. He didn't tell anyone about the headache because he didn't want to stop playing.

After the first time he got a concussion with rugby he continued to play. That was his worst concussion for rugby. He kept saying he was fine and continued to play but started to puke during the game so he came off. With the next two concussions that happened during rugby he came off the field right away and let the trainers do what they needed to do. Since the first concussion was so bad he never wanted to push it again, it was a wake up call for him. He has definitely had concussion experiences that were not caught where he thought maybe he should take it easy. He didn't take it easy because they weren't as bad as the ones he had before.

After his first concussion he felt ready to return to rugby. He had gone to the doctor and the doctor had told him it was a concussion and compared his injury to a broken arm. He needed to do exactly what they say to get better. So for him the first one was by the book. So when he came back to play after he felt fine, he felt a little nervous to get back in but not scared. The second concussion he didn't really go by the book and the third one he was nervous right before the game wondering if he had made the right decision to return to play. His nerves depended on the team they were playing.

He doesn't regret his decisions to return to play because nothing bad came of it. If he had been faced with this decision now with all the attention concussions have been receiving in sports he wouldn't have been so eager to return to play so soon. At the time concussions weren't really a big deal it was more just suck it up and play. According to Zeus, to be ready to play post concussion is to feel ready. Feeling ready meant playing

effectively with no headaches and no other side effects and feeling confident getting back out there without feeling scared or nervous.

Michelle Interview

Michelle has been playing soccer for a Canadian university for two years as a starting striker. She's been playing soccer and hockey since she was two years old. Michelle has had three serious concussions and a handful of undetected concussions. Her first concussion was when she was six. Her first concussion in sport was when she was 10/11 in hockey. Her most recent concussion happened when she was playing for her university. According to Michelle she blacked out forgetting what happened but she didn't lose consciousness. After experiencing her first concussion she felt disoriented. Symptoms tapered off as the week went on. She was removed from the game once the hit happened. She played the next day. They were on a road trip, which had two games in one weekend. She played the second game and complained a little bit about her symptoms throughout the game so they just kept an eye on her as she played. But they still allowed her to play. It was an important game in the season so she downplayed her symptoms. She was off for one practice day and then the AT told her she had to be asymptomatic for a certain amount of hours. She rode the bike in the training room and from there had to get medical clearance. The doctor was not very good with the clearance process. She got hit on the Saturday and her appointment was on the Thursday because she had a game on the Friday and she wanted to play in that game. She was still experiencing a slight headache when she went to see the doctor. She told him that she had a little bit of symptoms but he wasn't really concerned. As a kinesiology major she knew the symptoms of a concussion and how to get around them. She felt like he could have

done a better job at assessing if she was ready to play. By the standards of sports association now she wasn't ready to play. Knowing what she knows she probably shouldn't have played. Post-concussion syndrome is very serious and especially since she has had previous concussions it probably wasn't the smartest thing to play.

She was having symptoms during the biking process but didn't tell the athletic therapist because she wanted to play. Her season is relatively short and she was having a good year. Emotionally she hated sitting out and would do anything in her power to play. She was crushed when they said she might not be able to play for a number of weeks so that is when she said she was fine and had no symptoms so she could play on Friday.

A few of the girls had concussions at this time so they grouped together and all tried to play. Her teammates definitely wanted her to play. She felt some pressure to return to play. Not that the coaches were pressuring her but they were constantly asking if she was good, if she was coming back, if she was ready to play. She felt that sense of pressure more so from the coaches than the other teammates since they were all trying to get back in. There was no way she was going to tell the trainers that she had symptoms again because she wanted to play. It's a pressuring season and you go through many physical and mental issues and you have school to deal with too so you just keep going.

There were a few concussions she got in the States that were not caught. She was a freshman starter playing NCAA D1 soccer, which was very rare so there was no way she was going to tell someone. Playing soccer in the States was considered your job. Pressure from the coaches to play after an injury was huge in the States. You can't see a concussion so according to Michelle it's easily passed and easy to hide. Concussions

are undetectable so as parents of 10 year olds you don't really think about it but recently concussions have become really serious because of Sydney Crosby.

According to Michelle, to be ready to play post concussion ideally would mean to be symptom free. However, after she has experienced concussions as an athlete she feels her sport is her drug and she will basically play through anything. She did not feel that she was ready to play but it was her decision and she chose to play anyway.

Nicole Interview

Nicole has been wrestling for eight years. She has wrestled for a Canadian university for four years. She has had two diagnosed concussions and has had about four altogether. Her first concussion was in 2nd year she was in a car accident. The concussion happened in the off-season but she continued wrestling that whole year until she got another concussion and she stopped wrestling for a while. Her most recent concussion was in September 2012. After she was cleared to play she experienced some symptoms when she went back in. She felt different experiences after each concussion and each time she got one symptoms were more severe.

Her third concussion was in September 2012. She got hit and didn't tell the trainers then she got hit again and that one was really bad. She didn't tell the trainers because she thought she would be ok after a week and nationals were coming up and she really wanted to go because she could have won junior nationals. She kept going for her own personal reasons. She didn't feel pressures from coaches, they knew when she was lying. Between her fellow wrestlers there was different times when she felt pressures from them to get back in. It was mostly internalized pressures to get back in sooner and knowing that her fellow wrestlers were training everyday and she wasn't.

She described knowing she was ready to go back in when she woke up and she could tell that her brain had woken up and she wasn't still stuck in her cloud and she could feel her endorphins firing to wake up and the dizziness feeling was gone. She feels like she gets pretty depressed when she has concussions.

The being cleared to play process was that she needed to be symptom free for a week before she could start doing physical activity. It's different with wrestling because you're constantly getting hit and she knows how much she can do. After her second concussion she went back in too soon. She decided to go back in because nationals were at that time.

Her first concussion wasn't very emotional but the second one it was more just the loss of going to nationals that really made her respond. She remembers thinking that people were mad at her all the time. She felt alienated from the other wrestlers. The last concussion she had she wanted to stop everything and she didn't think she was going to wrestle ever again. She was a lot more depressed with that one. She was frustrated and ready to give up.

Once she returned to play her teammates were definitely cautious but she was ok with coming back in. She was ready, she wasn't thinking about the concussion at all. After her second one she doesn't remember at all if she was cautious when she returned because at that point she didn't realize how big of a deal concussions were.

She didn't tell anyone about her symptoms returning while playing because she wanted to get back into nationals and she blamed her symptoms on the weather. During her third concussion she felt fine when she returned but then she started getting symptoms again so she stopped practicing all together. She started to realize how

concussions really affect people later on in life. Now she knows that concussions are very serious.

In second year she had many concussion experiences that weren't caught and she didn't say anything because they would disappear relatively quickly, she didn't think anything of them. In her mind she knows that she has a specific skill set for a reason and unless she absolutely dies she's not going to stop. She's definitely more cautious as she eases into going back. She's not worried though that it's going to happen again because she can't really tell if it's going to happen again.

According to Nicole, being ready to play is knowing that you're not in a cloud anymore and you feel like yourself because your body will be ready to go no matter what. You feel motivated because if you're not motivated and you're still scared then you're not ready.

Stacey Interview

Stacey has played hockey for 12 years. She was the starting goalie in her freshman year at her university. She didn't really know much about concussions when she was younger. She had about 5-7 undiagnosed "little" concussions. Once she came to her university she got two major concussions, which had severe symptoms. She experienced 12 days of darkness where she had to be in a dark room and couldn't do anything. She was forced to quit hockey. First diagnosed concussion was November 2011. Her most recent concussion was December or January a few weeks after her first one. With her first concussion as soon as she got hit she knew that she was concussed. She had told another player and the player had told her that there was only 5 minutes left and the game was tied so she should champ it out. They ended up losing 2-0 because she

was so out of it. She knew she had a concussion and she still played because she was feeling pressure from her team and she was having a great game. She should have come off but she didn't. After getting her second one in December it was really frustrating. She was completely ready to go back in. The concussion made her realize how important her future is because the doctors were telling her she should seriously consider quitting.

The doctors said after her first one that once she was symptom free for over a week and began to work out without symptoms returning she could slowly progress back into the game and she was ready. She did not do the baseline concussion testing, so she was tested only after her concussion.

Emotionally she was a wreck with dealing with the concussion and the return to play process. She was frustrated. Her roommate would go to hockey but she would have to stay back which was tough for her. She knew she was done but she didn't want to tell anyone. The game where she got her final concussion, team had just finished beating another university team and she played a great game. The next game she told the coach that she couldn't play and then he told her that she was going to start her the rest of the year. She felt pressures from him and she messaged him back saying that she would do it and then sent him another message saying that she couldn't. She felt like she pissed many people off by deciding to quit. It was a tough decision for her. She felt a lot of pressure even this year, she still feels pressure because the team isn't doing well and she wishes she could be there helping. She feels that she's always going to feel the void of hockey and feel depressed. She's gotten use to people talking about hockey around her.

When making her decision to quit hockey it was a very stressful time for her. She had to think about her future. It was a tough decision for her because she didn't want to be an airhead who can't even think.

The concussion experiences that she had that were not caught were all from hockey and getting shots to the head. One time she got hit so hard that she saw stars but she didn't think anything of it and didn't do anything. She didn't know much about concussions and thought she was fine. She was just toughing it out. She had many of those situations and she just didn't tell anyone. She didn't tell anyone so she could play and she didn't want anyone to worry about her. She feels like no one knows about concussions in depth enough and she only started learning about them after it was too late. People really need to learn about them more and have more awareness. It was a huge deal for her that she didn't have a baseline concussion testing done before she got her first concussion because what were they comparing her results to if they had no baseline scores. She thinks that everyone should go through these tests before their season starts, before it's too late.

Being ready to play means she is a week without symptoms and confident that she's mentally and physically ready to play.

General Descriptions

Bob Interview

Bob has been playing basketball since grade 6. He had had two serious concussions. His first university level concussion was his first. He minimized his symptoms and continued to play until he was removed from the game. Following his first concussion he wanted to return to play so that he had the opportunity to go out of

province. He was cleared the day before leaving but admits that he wasn't ready to return and was more cautious to play. He was frustrated after his 2nd concussion because he knew he was going to sit out again. Both concussions happened in the same year. Following his final concussion he has somewhat alienated himself from the team and other people. He is still experiencing concussion symptoms and changes in mood with depression like symptoms. He followed the concussion protocol and returned to play after being cleared by a doctor. He felt ready to play and was asymptomatic. With his second concussion he was hit during the game and continued to play until he was hit again and was removed from the game. However, he was put back into the end of the game. The coaches were unaware of the concussion. He knew he had a concussion but wasn't going to say no to the coach because he wanted to play. He followed the concussion protocol after the second concussion but midway through started experiencing symptoms again. His pressures to return to play were all internalized. He admits that he may have had undiagnosed concussions but nothing to the extent of his diagnosed concussions. The men's basketball team has recently taken concussions more seriously and is more cautious with return to play decision-making. He experiences feelings of frustration and is unable to watch games. He wants to be a part of the team's success and believes he could make a difference if they had lost. Being ready to play to Bob means being symptom free and not thinking about the injury while playing.

John Interview

John has been playing basketball since he was six. He has had eight concussions, with his first in grade 6. His first university level concussion was his 5th concussion. He minimized the symptoms and kept playing, feeling he is a person who cannot NOT play.

He did not consult medical attention until two weeks later. He continued to have concussions and each got progressively worse, from game stoppage to full unconsciousness. He continued to play and tried to “cheat” the readiness criteria by denying symptoms and confirming his importance to the game. The number of concussions continued to increase and he was aware that if they continued he would be forced to stop playing. This last concussion was a varsity career ending injury. Only after his first concussion he was cleared to play. With the others he was never truly cleared and always played through symptoms. The concussion protocol was a new development. Return to play relied solely on the athlete and how he/she decided to report their symptoms. In spite of other’s support, he still feels that he has lost his identity and feels as though he has disappointed everyone. He developed depression-like symptoms and changes in mood. Coaching helps but he still feels like he could have made a difference if he was able to participate. A consequence of his concussion was that he was forced to move back home due to the severity of his symptoms. His symptoms are still present and he was diagnosed with severe post concussion syndrome. His pressures to return to play were all internal. He wanted to be a part of their success and thought he could make a difference if they had lost. Others understood the severity of his concussions and expressed to him how important it was to not go back too soon. He doesn’t regret his decision to continue to play with symptoms because that’s who he is. He knew if he came forward that he would be forced to sit out. The concussion was at the back of his mind while he played but the game took over. He now realizes the severity of concussions and how lucky he is. Being ready to play means being symptom free, emotionally ready and physically ready. However, for John as long as he wasn’t experiencing the symptom of

dizziness he would play through all other symptoms. According to John, athletes will lie because they are driven on competition. Return to play relies solely on the athlete and how they are able to portray their symptoms.

Zeus Interview

Zeus has been playing rugby since grade 9. He has had four serious concussions. He had all four concussions in the span of one year. After his first concussion he minimized the severity of the following three because they did not compare to the severity of the first. His most recent concussion was his 4th concussion. He knew he was ready to go back in based solely on when he felt ready. He was nervous to go back in after his third concussion because they all happened in a short period of time. He didn't have to follow any concussion protocols. They advised him to seek medical attention but he refused. He compared all his concussions to his first concussion. When he had his first concussion he did seek medical attention and assumed the process would be similar. Coaches and teammates tried to put pressure on him to play but he ignored them and focused on himself. Concussions are an invisible injury and most of his teammates have had concussions so they realize the importance of taking your time to recover. After his first concussion he minimized his symptoms and continued to play because he did not want to stop playing. After his second concussion he continued to play but was removed from the game. However, with his following two concussions he removed himself from the game because he was aware of the severity of concussions. He had a number of undiagnosed concussions where he should have stopped playing but continued to play through them. The return to play protocol went according to plan for the first concussion and he returned to play without symptoms. The following concussions he went by how he

felt and was unsure if he made the right decision to return to play. His nerves before re-entering a game following a concussion depended on the skill of the team they were playing. If the game was important he would play regardless if he had symptoms feeling that his team needed him and he would do anything to play. He doesn't regret his decision to continue to play with symptoms because nothing bad came of it. If he had been faced with the decision now with all the attention concussions have received recently he wouldn't be so eager to return to play. Being ready to play means being able to play effectively with no symptoms and having the confidence to return to the game without being scared or nervous.

Michelle Interview

Michelle has been playing soccer since she was two. She has had three serious concussions. Her first one was when she was six. Her most recent concussion was her 3rd concussion, which happened, in her first year at her university. She minimized her symptoms in order to play in the game the next day, feeling that it was an important game and that her team needed her to play. Concussion protocol was very compressed. She had to get medical clearance by a doctor who cleared her almost immediately in order to play in the game the following day. She was still experiencing symptoms once cleared but she wasn't going to sit out the next game. She acknowledges it wasn't the smartest idea to play with symptoms and realizes how severe concussions truly are. However, she denied her symptoms in order to continue to play, feeling she would do anything in her power to play. Emotionally she hated sitting out and felt internal pressures to return. Some of her teammates had concussions at that time so they grouped together to get back into play as soon as possible. She felt pressures from her teammates and her coaches to return to play.

It's a pressuring season with the season being so short and since she was symptomatic she just dealt with it and kept going. She had a few undiagnosed concussions while playing in the States. She was a freshman starter, which was rare so she was not going to tell anyone about any possible injuries because she had something to prove. Other times she got hit in the head and got a headache but didn't think it was anything serious. According to Michelle, concussions are an invisible injury and thus go undiagnosed. Parents of younger children don't realize the severity of concussions but recently concussions have received a large amount of media attention. Being ready to play means being symptom free. However, for Michelle her sport is her drug and she will play through almost anything.

Nicole Interview

Nicole has been wrestling for eight years. She has had about four concussions in total. Her first one was in her 2nd year of university and was not sport related. She didn't realize she had a concussion until she got her second one while wrestling. Her most recent concussion was in September 2012. Once she was cleared to play she was still experiencing symptoms resulting in a 2-month leave from wrestling. She continued to have concussions and each got progressively worse. A few times she was hit in the head initially but continued to wrestle anyway until she got hit again. She continued to wrestle because nationals were approaching and she believed she could have won. She continued to wrestle for her own personal reasons. She didn't feel pressures from her coaches but she did feel pressures from her fellow wrestlers. Most of her pressures to return to play were internal. She felt ready to play when her mind was clear, when she was symptom free and she felt like she was "awake". She developed depression like symptoms,

changes in mood, and alienated herself from other people. Concussion protocol was basically symptom free for a week before you begin physical activity. Return to play is very athlete oriented as athletes are constantly being hit and they know when they are ready to return. With the loss of going to nationals she felt as though she disappointed everyone. She felt alienated from the other wrestlers because she had to stop training. She was experiencing frustration and thought about giving up. When she returned to play she wasn't thinking about the concussion. She was unaware of the severity of concussions until her most recent concussion. To this day she is still experiencing some depression like symptoms but continues to wrestle. She now realizes how severe concussions are and is more cautious about continuing to wrestle after a head injury. She had many undiagnosed concussions. She didn't tell anyone because symptoms would disappear relatively quickly and she didn't think anything of them. She believes that she has a specific skill set and unless she dies she will not stop wrestling. Being ready to play is feeling like yourself again, clear minded, and you feel motivated to go back in.

Stacey Interview

Stacey has played hockey for 12 years. She has had two serious concussions and about six undiagnosed ones. Her first university level concussion was her 1st. She minimized her symptoms and kept playing, feeling pressure from her team and herself to finish the game. Her 2nd concussion happened a few weeks later, which ended her varsity career playing hockey. This was a very frustrating and difficult decision for her but she realized her future is more important than playing hockey. She followed the concussion protocol and was cleared to return to play after the first concussion. She felt ready and had no symptoms upon returning. She did not complete a baseline concussion test but she

was tested following the concussion. Emotionally she was frustrated with dealing with the concussion and the return to play process. Her symptoms kept her from going to class and watching the games. She knew she wasn't going to be able to play anymore but she didn't know how to tell everyone. She felt pressures from the coach and her team to continue to play. She felt like she disappointed everyone but understands that her future is more important. Even now she feels as though if she was still playing she could have made a difference. She has developed depression-like symptoms. Her parents claim that it's hard on them too but she feels no one truly understands what she is going through. She is currently symptom free and determined to stay active. She was unaware of the severity of concussions and decided not to tell anyone about her symptoms in order to continue to play, feeling she did not want others to worry about her. She thinks we need to learn about concussions before it's too late and believes that all athletes should take the baseline concussion testing before their sport begins. According to Stacey, being ready to play means being symptom free and confident that you are mentally and physically ready.

Thematizing and Consolidating Patterns

Most of the participants in this study experienced their first concussion before they were teenagers. The idea of a concussion was accepted and even seen as normal, regardless of whether they understood what a concussion was or entailed at the time. They did not realize the severity of the concussion until it was too late and they were forced to quit.

All athletes continued playing after sustaining a concussion. They just wanted to play. The game ultimately took over and they would do anything in their power to play.

The interesting part is they realized that they probably shouldn't have gone back in but they chose to anyway.

The athletes experienced an emotional rollercoaster of feelings. Key emotions displayed were frustration, helplessness, fear, anxiety, and nervousness to return to play. Most athletes spoke about suffering from depression and seeing their sport as their drug and that nothing would stop them from playing.

All athletes experienced pressures to return to play. Either it was internal or came from their teammates and coaches.

It was evident that as the number of concussions experienced increased the severity and symptoms of the concussions got progressively worse. However, it seemed as though their thresholds of tolerance increased and they believed they could play through it and lied about symptoms to keep playing. They would lie throughout the return to play process so that they could be cleared to return to sport even though they knew they weren't ready and were still experiencing symptoms.

The athletes seemed to experience a "hero" complex. They believed wholeheartedly that the team could not win without them. If the team was losing they could have helped them win and if the team was winning they wanted to be a part of the success. This was seen with every team based athlete and it didn't matter if the athlete was a starter or not.

An interesting similarity found across every interview was that each athlete has began to realize the seriousness of concussions now. They all spoke about wanting a future and hoping it wasn't too late. After experiencing their first concussion they weren't worried about anything except continuing to play but after their most recent concussions

it was evident that each athlete was getting more cautious. This also depended on the age and maturity level of the athlete. They all had something to say about the media and Sydney Crosby and how his experience with concussions was a wake up call for them. Nevertheless, there were still some athletes who realized too late how serious concussions are and were forced to quit their sport and are currently suffering from post concussion syndrome, a life altering disorder.

Being ready to play for each athlete meant being symptom free, confident, motivated, and emotionally and physically ready to play. The athletes believe that there is no actual test that can prove this because the results solely rely on the athletes and they can choose to lie and cheat the test to return to play sooner. They feel as though their sport is everything to them and even after experiencing concussions they may feel more cautious but they will still do whatever is in their power to play even if it means risking their safety.

Revelatory Phrases

“Eventually I knew they were going to shut me down”

Athletes are aware that they will be potentially “shut down” by the concussions or by the authorities that have to be accountable. Even with this knowledge they continue to play until they are removed from their sport.

“I didn’t think anything of it...”

Athletes downplayed the seriousness of their concussions and attributed their symptoms to other reasons such as the weather.

“The game took over...” “I’m a player. I need to play.” “I can’t not play.”

The athletes associated playing as a part of their identity and without it they could not function. The idea of the “hero” complex comes into play and they believe that continuing to play is their only option to benefit both themselves and the team.

“Out of the fog”

When athletes felt that they were “out of the fog” and clear headed they were ready to play.

“Feeling off”

Feelings associated with their symptoms and how they affected them mentally, cognitively, and psychologically.

“At the back of my mind I knew I wasn’t ready”

There seems to be an awareness just out of reach at the back of their mind, which is telling them that they are not ready to return to play. However, they do return to play.

Research Questions

What behaviours and influences might be active within the decision making process?

- a. Are athletes cognitively, psychologically, and mentally ready to return to play after being cleared to play following a concussion?

As seen in this study, athletes are not cognitively, psychologically, and mentally ready to return to play. They feel anxious and nervous to return and most are still symptomatic when they return. The **game ultimately took over** and they would do

anything in their power to play. The interesting part is they realized that they probably shouldn't have gone back in but they chose to anyway.

b. Do athletes feel pressure to return to play? (team, coaches, themselves etc)

Yes athletes feel pressures to return to play from their coaches and teammates. The evident pressure that they all feel is internalised pressure to return to play. No matter the position on the team they all believe that they could make a difference. The athletes seemed to experience a “hero” complex. They believed whole-heartedly that the team could not win without them. If the team was losing they could have helped them win and if the team was winning they wanted to be a part of the success. This was seen with every team based athlete and it didn't matter if the athlete was a starter or not. They also feel the pressure of being found out and **shut down.**

c. Do athletes mask/ hide their physical symptoms (headaches, nausea etc) to return to play sooner?

Yes athletes hide their symptoms to return to play. Athletes will do **anything in their power to play**, they will lie and cheat the test to return to the game as soon as possible. At the **back of their minds** they know they aren't ready to play but they decide to play anyway.

What does it mean to be ready to play post concussion?

In order to play, an athlete knows that he/she ought to be symptom free, confident, motivated, and emotionally and physically ready to play. However, the athletes believe that there is no actual test that can prove this because the results solely rely on the athletes and they can choose to lie and cheat the test to return to play sooner. They feel as though their sport is everything to them and even after experiencing concussions they

may feel more cautious but they will still do **whatever is in their power to play** even if it means risking their safety. Readiness was equivalent to clarity. When athletes felt clear and their mind was **out of the fog** they believed they were ready to play.

Felt Sense

With every participant, the body was sending signals to the mind (“at the back of my mind, I knew.....”) to stop but every person tried to ignore these signals in order to continue to play. Signals were sent through signs and symptoms and each of them knew they were hurt but made the decision to deny their body’s signals, or at least, keep them at the back (and not the front) of their mind.

These are some signals: they are still in the fog, they felt off, there is something at the back of their mind, and they are anticipating being shut down. These are all signals, and the revelatory phrases reveal them as embodied signals.

Being symptom free confident, motivated and emotionally ready to play are all the language of the literature and participants repeating what the literature tells them to say about being ready to play. But being out of the fog is the felt sense. By returning to play, they are ignoring what is in the back of their mind that is telling them that they are not ready. Something in the back of their mind won’t let it go and that is ultimately the signal albeit, the one they resist attending to.

“At the back of their mind” is a revelatory phrase that talks about the embodied feeling of not being ready, and that” being out of the fog” is the embodied feeling of being ready. Even with the preponderance of uses of these more embodied expressions of their felt sense, they can still use the language of the literature and physicians because

they are very familiar with it and they use it to keep playing (..... but at the back of their mind they know they aren't ready).

The medicalized language is familiar to them. In phenomenology we call this the natural attitude, the thing that becomes so familiar it becomes invisible, the thing that is the vehicle of expression but is largely unacknowledged. "Felt sense" language tends to disrupt this natural attitude, but is kept at bay by the larger, usually disembodied, performance narratives that govern participation in competitive varsity sport. Athletes know what they are supposed to say in order to return to play, so that's what they are going to say in order to return to play. They knew that eventually they were going to be shut down, so they say what they have to say so that they can delay that inevitability for as long as possible.

This is the language of the literature, medicine, diagnosis and it is the language of ready to play; thus, in order to return to play they use this language to their own advantage.

CHAPTER FIVE- DISCUSSION

The purpose of this phenomenological study was to describe athletes' felt sense of readiness returning to play following a concussion. This study focused on decision making in return to play and how power and pressure can influence when an athlete is cleared to play. Discussion of the pressures athletes face in the literature review to this document highlights the complex reasons shaping athletes' views on when to return to play.

As mentioned in the literature review, research studies have revealed that athletes may face pressure to return to sport or to meet specific return deadlines and may feel isolated or alienated from their teammates or coaches (Gould, Udry, Bridges, & Beck, 1997; Podlog & Eklund, 2004). My results support and augment these findings by showing that the university athletes in my study feel pressure from their teams and coaches as well as internal pressures to return to play sooner. They feel alienated from the team and want to return to play sooner than they should. These athletes will cheat the system in order to meet certain deadlines to play. They accomplish this by gaining rapport with those who are distributing the test, memorizing questions on the test (such as the options for immediate memory and months in reverse), lying about symptoms, and not performing well on their initial baseline test thus making it easier for them to score the same or higher on their follow up test.

Sport psychology research reveals that athletes may be physically healed and rehabilitated but not necessarily psychologically prepared to return to competition following an injury (Podlog & Eklund, 2004). The results of this study support these findings, in that athletes feel anxious and nervous to return. "The game ultimately took

over” and “they would do anything in their power to play”. The controversial issue is that they realised that they shouldn’t have gone back in, but they made the decision to return nonetheless knowing that they were putting their health at risk.

Gould et al. (1997) argue that athletes returning from injury may commonly experience concerns and/or difficulties in three psychological areas: competency, autonomy, and relatedness. The self-determination theory suggests that all individuals have basic needs in these three psychological areas, and that when these needs are met by the environment individuals are more likely to experience enhanced self-motivation, increased well being, and improvement in sport performance (Ryan & Deci, 2000). Athletes returning to their sport have fears and concerns about how their body will be able to handle the demands of the sport, which suggests competency issues may be significant (Bianco, 2001). My findings showed a different trend, athletes returning to sport were more cautious and nervous that it would happen again when returning but ultimately the game took over and they would do anything in their power to play. Also, they had to know they were not competent because they feared being “caught” and “shut down”. The idea that they would do anything in their power to play is their sense of autonomy. This difference may have been created by this study’s use of multiple varsity level sports (individual *and* team sports) whereas Gould et al. (1997) focused primarily on skiers.

In addition, knowledge that athletes may receive external pressures to return to sport and that they value freedom from pressure suggests autonomy issues may be relevant (Bianco, 2001; Podlog & Eklund, 2004). My results augment these findings by showing that athletes receive external pressures to return to play. However, they also

experience a high degree of internal pressures to return to play (and these may indeed also be internalized from others' pressure), which contradicts athletes valuing freedom from pressure since they put pressures on themselves to return as soon as possible. There is contradiction with these athletes. On one side "at the back of their mind" they know they shouldn't return to play but on the other side they feel there's an internal pressure to return to play as soon as possible.

Lastly, being aware that injured athletes may often feel a sense of alienation from their friends, teammates and coaches suggests issues of relatedness may also be significant in return to play transition (Ermler & Thomas, 1990; Hughes & Coakley, 1991). The results of this study support this notion by showing that athletes experienced a rollercoaster of emotions. Athletes felt frustrated, helpless, scared, anxious, depressed, and nervous to return to play. They felt alienated from the team since they were unable to participate. They also feel absolutely necessary to the team, which supports the idea of relatedness. It is clear that they are trying to manage lots of internal contradiction.

The main issue with most concussion grading scales is that athletes, particularly, the athletes in this study, believe they rely on the self-report of athletes who are often times motivated to underreport their symptoms so that they can return to competition prematurely (McCrory et al., 2012). While recent developments have produced improved and more objectively designed protocols, with less reliance on athlete report, these seemed to function as challenges to be overcome for the athletes in this study. Each athlete reinforced this issue by demonstrating that athletes will choose to lie and cheat the test to return to play sooner. They feel as though their sport is everything to them and

even after experiencing concussions and feeling more cautious, they “will do anything in their power to play” even if it means risking their health.

Furthermore, the majority of injured players were shown to continue to play following a probable concussion (McLellan & McKinlay, 2011). Athletes tend to believe that it shows strength and courage to “tough it out” and play when they are injured (McLellan & McKinlay, 2011). Not only is this belief wrong, it can put athletes at risk of serious injury. My study corroborates these findings. All athletes in this study continued playing after sustaining a concussion. They just wanted to play and the game ultimately took over. The curious thing is that at the back of their mind they realised they shouldn’t have gone back in and that they were “feeling off” but they made the decision to return anyway. They believed the team needed them to succeed.

According to Bramley et al. (2012), athletes are more reluctant to notify the coach or trainer of a concussion injury during a championship game as compared to a game that was not defined, indicating the participant may be willing to risk further injury depending on the situation. My results provide an elaborative counter-example to these results by showing that it didn’t matter if it was a championship game or an exhibition game, my participants would continue to play regardless of the importance of the game. They “would do anything in their power to play”. They believe they are necessary and that playing is a big part of their identity. This may be due to the fact that Bramley et al. (2012) studied high school athletes whereas my study focused on university aged varsity athletes. Given that athletes will mature as they play, there is a need for early and ongoing education on neuroplasticity and the pathophysiological cascade. If athletes, parents and coaches were aware of the cellular effects of concussions they may be more

inclined to think first before they return to play. The primary elements of the pathophysiologic cascade following a concussive brain injury include abrupt neuronal depolarization, release of excitatory neurotransmitters, ionic shifts, changes in glucose metabolism, altered cerebral blood flow, and impaired axonal function (Giza & Hovda, 2001). The athletes need to be aware that if they continue to play the brain is vulnerable and the recovery program could be much longer if they continue to play. Also, knowing that neuroplasticity is finite and could impact recovery and memory loss later in life may force athletes to think twice before returning to play. Not only can concussions lead to deterioration late in life due to neuroplasticity limits, but they can also lead to second impact syndrome, post concussion syndrome, and even chronic traumatic encephalopathy.

An unexpected finding was that all athletes in this study experienced a “hero” complex. They believed whole-heartedly that their teams could not win without them. If the team was losing they could have made the difference and if the team was winning they wanted to be a cause of that win. It was unexpected because it didn’t matter if they were a starter or a benchwarmer they believed that they could have made a difference in the game.

Another unexpected finding is that some athletes described their visits with the sport physicians in the being cleared to play process as “pro-playing”. What I mean by this is that the athletes reported that some physicians didn’t really test if the athlete was physically and mentally ready to play and didn’t ask much about their symptoms. Concussion protocols were compressed with certain athletes depending on when their next game was so that they were cleared to be able to play. According to several

informants in this study the attending physician appeared to be colluding in an effort to allow the athlete to keep playing because they (the physicians) know that for the athletes, the game is important. In this situation they believe the athlete will tell them if anything is wrong when athletes in my study claim that they know that's not going to happen, i.e. the athlete will not disclose symptoms. One of the implications of my study is that physicians need to be more attuned to the possibility that athletes will lie and do anything in their power to return to play even if this means risking their health. Physicians need to ask the tough questions and educate their patients on the severity of playing with a concussion. Other tests need to be done other than relying on the athletes' self report of their feelings and symptoms. This relates to the literature because according to Echlin (2012), the independent physician observers were empathetic toward the athletes' desire to play and initially were very cautious about making the decision to diagnose and restrict a player secondary to a concussion diagnosis. The struggle with this is team related bias that occurs because of relationships that develop between the physician, players/trainers/coaches, and team administrators (Echlin, 2012). The team physicians often experience both bias and social pressures when determining diagnosis and return to play decisions and can experience feelings of guilt (Echlin, 2012).

An interesting finding found across all participants was that each athlete had begun to realise the seriousness of concussions now. At a young age when most of my participants experienced their first concussion they were unaware of the severity of receiving a concussion. Each participant spoke about wanting a future and hoping that it wasn't too late. After experiencing their first concussion they weren't worried about anything except continuing to play but after their most recent concussions it was evident

that each athlete was getting more cautious. This depended on the age and maturity level of the athlete. The younger the athlete the more they thought they could conquer anything. However, as they aged and had begun to realize how serious concussions truly are they were more cautious with their return to play process. Yet, there were still some athletes who realized too late how serious concussions are and were forced to quit their sport and are currently suffering from post concussion syndrome, a life altering disorder. After periods of denial (“I didn’t think anything of it”), they realize they are in trouble. It is no longer at the back of their mind. It is front and center in their lives.

Underreporting of concussion is not exclusive to paediatric athletes (Meehan, Taylor & Proctor, 2011). However, paediatric athletic organizations are less likely to have a formal organized approach to concussion management and dedicated personnel with concussion training, such as team physicians, athletic trainers, and neuropsychologists (Meehan et al., 2011). This inherent lack of personnel and resources results in further reliance on self-reporting of symptoms in younger athletes, making underreporting more of an issue in paediatrics than in adult sports medicine (Meehan et al., 2011). In my study, for all six participants, the age range of their first diagnosed concussion was from age 6-18. Furthermore, all athletes admit to having undiagnosed concussions that were not caught in elementary school. Yet the child SCAT 3 is only being developed now. It is important for physicians who care for paediatric and adolescent patients with concussions to educate parents and patients to follow return to play protocols and be more conservative in the decision to return the adolescent athletes to sport.

Concussions are hard to identify since the majority of them are mild which make them difficult to diagnose. Most athletes will mask and lie about symptoms to continue competing. Thus, athletes, referees, parents, coaches and health care providers need to be educated in concussion detection, its signs and symptoms, assessment techniques and guidelines for safe return to play. According to Echlin (2012), coaches didn't want their players to get assessed after a suspected brain injury for fear that they might be declared as concussed and advised not to play, and the players didn't want to be assessed for a concussion in case they were declared as concussed since it would limit their playing time. In order to improve concussion prevention and management, the coach is central to potential change (Echlin, 2012). Echlin's study showed that everyone was happy about this program until it started working and athletes had to stop playing. Education is vital to decrease the incidence of concussion and improve treatment protocols.

Research has shown that a consistent management and evaluation protocol is necessary but further research has shown that athletes, trainers, physicians, and coaches may want these protocols but when it comes down to following these steps athletes, trainers, physicians, and coaches are unwilling when it comes to abide by these protocols.

The inability of team physicians and athletic therapists to precisely estimate the duration of symptoms, to predict the nature of the symptoms, or provide definitive instructions for effective management can leave the concussed athlete feeling confused, isolated and helpless (Chertok & Martin, 2013). These factors can contribute to a difficult psychological experience for the concussed athlete (Chertok & Martin, 2013). Decision making for returning to play is often confusing and can lead to uncertainty in decision making (D'Hemecourt, 2011). This is because of the nature of sports related concussion

and the subtleness of signs and symptoms. There is a reluctance to deploy good return to play protocols because athletes are unwilling to take time off away from their sport to recover. Unlike a broken bone, it is often hard to see the symptoms of a concussion and athletes will lie about their symptoms in an effort to get back on the field in time for the next game. With concussions athletes believe they can “tough it out” where with a musculoskeletal injury they are unable to play for the injury impairs them physically. There is no quick treatment plan in concussion rehabilitation thus leaving the concussed athlete without a defined treatment strategy and an unknown rehabilitation time frame.

There are three major categories of concern when deciding to return an athlete to competition: second impact syndrome (SIS), post-concussion syndrome, and chronic traumatic encephalopathy (CTE) (D’Hemecourt, 2011). If parents, coaches and athletes are better educated in the life long consequences of returning to play they may be more inclined to think about their futures before they make the decision to return to play.

The 4th International Consensus Statement is a great statement about the state of concussion and the difficulty of detection but it doesn’t go nearly far enough to say athletes will lie and will keep playing. There’s something about how coaches are coaching them or how the culture adores them that makes them believe that it’s okay to sustain continuous close brain injuries and there is no firm condemnation of that in the consensus statement. I realise that the consensus statement is conservative and reflects the agreement of all those who are a part of the committee, but the consensus statement needs include the importance for concussion education to occur at a younger age and for parents, coaches and athletes to understand the dangers of returning to play too soon. There needs to be a condemnation of this culture of (primarily masculinizing) heroic

narratives that gives them permission to continue to hurt themselves. For males, conventional forms of masculinity are still highly valued (Connell, 1995). Unlike the biological state of maleness, masculinity is a gender identity, constructed socially, historically, and politically, and is learned through participation in hyper-consumerist/materialist or patriarchal societies and competitive sports (Connell, 1995), which tend to valorize these masculinizing virtues. As a consequence, a man may be described as “masculine”, because he behaves in ways deemed appropriate for men, and women who embody the same heroic virtues tend to be equally valued due to their allegiance to these values (Young & White, 1995; Connell, 1995). This is seen in sport with both men and women in order for them to not be seen as weak or soft (Young & White, 1995) It didn’t matter if the participants in my study were male or female they all experienced this masculinizing heroic narratives. They believed they could have affected the outcome of any game and believed they were seen as “a baby” if they didn’t continue to play.

The 4th International Consensus Statement indicates that we know a lot about the longitudinal effects of concussion. Be that as it may, a series of longitudinal case studies could actually personalise it because the consensus statement refers to a collective. Such longitudinal study would be ideal because it would show the short term and long-term effects of concussions and the hardships athletes have to go through. The idea of neuroplasticity, the cascade effect, post concussion syndrome, second impact syndrome, and CTE may scare athletes into thinking twice before retuning to play prematurely. Personalising concussions and the seriousness of them seems to be more effective. In my study it was shown that Sydney Crosby woke up many people and personalised a

problem that many people thought was irrelevant. A longitudinal study would allow us to personalise this issue and hopefully educate people on the seriousness of concussions and improve management protocols. Most of the participants in my study sustained their first concussion at a young age and people don't seem to be horrified and terrified with the fact that they continue to play and endanger their lives each time they decide to ignore symptoms and return to play. The consensus statement is important because we have more definite knowledge and yet until we personalise it, it doesn't seem to matter. In many ways the consensus statement is the thing at the back of our mind that we're still trying to pretend we don't know. A culture of sport adoration is doing with the consensus statement what the athletes are doing with their symptoms. They are ignoring it and they think that if they don't pay attention to it that it will go away.

In the return to play process athletes are not always cognitively, psychologically, and mentally ready to return to play after being cleared to play following a concussion. Most athletes in my study are still experiencing symptoms when they return to play and when they do return to play they feel cautious and nervous but the game will ultimately take over. Athletes feel a great deal of pressure to return to play. These pressures are either internal or from external pressures such as coaches and fellow teammates. They also felt the pressures of being found out that they were lying about still having a concussion and ultimately being forced from the game. Athletes believe that without their presence in a game the team has a greater chance of losing. They believe that if their team lost they could have made a difference and if their team is winning they could have been part of the victory. The interesting observation is that it didn't matter if the player was a starter or a bench player bringing on the theory of a "hero" complex. Athletes will lie

and hide symptoms to return to play sooner. Being ready to play for each athlete meant being symptom free, confident, motivated, and emotionally and physically ready to play. However, the athletes believe that there is no actual test that can “prove” this because the results rely heavily on the athletes and they can choose to lie and/or cheat the test to return to play sooner.

With every athlete in this study the body was sending signals to the mind to stop but every person tried to ignore these signals in order to continue to play. Signals were sent through signs and symptoms (e.g. “fog”, “off”, “knew I would be shut down”, “knowledge at the back of their mind”) and each of them knew they were hurt but made the decision to deny their body’s signals. Thus, the athlete’s felt sense of readiness was distorted by their need to return to play, no matter the consequences.

Limitations

The participants in this study reflect the experience of sustaining a concussion and the return to play process. All methods of data rely on self-report data from participants. As a result, the data in this study are limited to the information participants were willing to share about their experiences in the athletic environment. Participants may not recall certain events or may not be able to convey the significance of having a concussion and the return to play process.

In qualitative research, the researcher takes a major role in the outcome and process, as she is the one developing the tools that will be used to gather and analyse information (Creswell, 2007). I possess strong background knowledge of concussions and return to play as a student athletic trainer. I have never experienced a severe concussion and thus have not had to go through a return to play process. As a result, future

investigations where the primary investigator has had a concussion and gone through the return to play process first hand might be helpful.

This study focused on only one Canadian university, thus it cannot be generalised to other populations; however, I suspect it is highly likely that other populations may be going through the same thing. The world of competitive university sports is a small one and it is necessary to protect the identity of the participants. Therefore, the participating athletes will only be identified their sport and the fact that they are enrolled in a Canadian university. Athletes were drawn from different sports, programs and universities. All athletes have been assigned pseudonyms and other potentially identifying information has been removed.

Implications

The results of this study support the notion that the lack of understanding regarding the symptoms and effects of concussions by athletes and coaches can generate pressure on both the team physicians to diagnose concussions as well as the sport administrators who need to be aware what concussion protocols are being followed. The significance of appropriate diagnosis of a concussion and the return to play protocols may be complicated by the number of guidelines available as well as the reliance on the athlete to self-report the symptoms of a concussion. SCAT 3 may be accepted by all but not all institutions are implementing the SCAT 3 test and without baseline scores SCAT 3 is inadequate. Because no two people can be diagnosed in exactly the same way, guidelines may inhibit proper treatment. However, should an error in judgment occur, litigation against the physician, the athletic administrator, and the university may result.

The results of this study demonstrate the importance of concussion education in younger athletes. It is important, for physicians who care for paediatric and adolescent patients with concussions to educate parents and patients to follow return to play protocols and be more conservative in the decision to return the adolescent athletes to sport.

Each athlete began to realize the seriousness of concussions after they had sustained their most recent concussion. They all spoke about wanting a future and hoping it wasn't too late. After experiencing their first concussion they weren't worried about anything except continuing to play but after their most recent concussions it was evident that each athlete was getting more cautious and worried about their futures after their sport. Sydney Crosby's experience with concussions was a wake up call for them and made them more cautious. However, that didn't stop some athletes from continuing to play and they learned the hard way that this was a bad decision when they were forced to quit and are now living with post- concussion syndrome.

Future studies on post- concussion syndrome and the seriousness of post concussion syndrome would benefit athletes. A longitudinal study of people living with post concussion syndrome and the major life changes that patients need to undergo would give athletes a sense of the severity of concussions and the health risks associated with continuing to play with a concussion. Athletes, parents, coaches, and trainers need to be better educated on the severity of concussions, concussion detection (i.e. hard to identify and difficult to diagnose), assessment techniques, and the serious health consequences that can result from playing with a concussion.

REFERENCES

- Ananthaswamy, A. (2003). Injury puzzle solved. *New Scientist*, 177(2389), 21
- Alvesson, M., & Deetz, S. (2000). *Doing critical management research*. Thousand Oaks, CA: Sage.
- Ashare, A.B. (2009). Returning to play after concussion. *Acta Paediatrica*, 98, 774-776
- Bailes, J. E., & Cantu, R. C. (2001). Head injury in athletes. *Neurosurgery*, 48(1), 26-45.
- Bauman, J. (2005). Returning to Play: The Mind Does Matter. *Clinical Journal Of Sport Medicine*, 15(6), 432-435.
- Bianco, T. T. (2001). Social support and recovery from sport injury: elite skiers share their experiences. *Research Quarterly For Exercise & Sport*, 72(4), 376-388.
- Burrell, G., & Morgan, G. (1979). *Sociological paradigms and organisational analysis*. Brookfield, VT: Ashgate Publishing Co.
- Bramley, H., Patrick, K., Lehman, E., & Silvis, M. (2012). High school soccer players with concussion education are more likely to notify their coaches of a suspected concussion. *Clin Pediatr*, 51(0), 332-336
- Cantu, R. (2009). Second-impact syndrome. *Clin. Sports Med.* 7:37-44.
- Chertok, G. J., & Martin, I. H. (2013). Psychological aspects of concussion recovery. *International Journal Of Athletic Therapy & Training*, 18(3), 7-9.
- Collie, A. A., Maruff, P. P., Makdissi, M. M., McCrory, P. P., McStephen, M. M., & Darby, D. D. (2003). CogSport: reliability and correlation with conventional cognitive tests used in postconcussion medical evaluations. *Clinical Journal Of Sport Medicine*, 13(1), 28-32.
- Collie, A. A., Maruff, P. P., Makdissi, M. M., McStephen, M. M., Darby, D. G., &

- McCrory, P. P. (2004). Statistical procedures for determining the extent of cognitive change following concussion. *British Journal Of Sports Medicine*, 38(3), 273-278.
- Collins, M. W., Field, M. M., Lovell, M. R., Iverson, G. G., Johnston, K. M., Maroon, J. J., & Fu, F. H. (2003). Relationship between postconcussion headache and neuropsychological test performance in high school athletes. *American Journal Of Sports Medicine*, 31(2), 168-173.
- Collins, M. W., Iverson, G. L., Lovell, M. R., McKeag, D. B., Norwig, J. J., & Maroon, J. J. (2003). On-field predictors of neuropsychological and symptom deficit following sports-related concussion. *Clinical Journal Of Sport Medicine*, 13(4), 222-229.
- Connell, R. (1995). *Masculinities*. Los Angeles: University of California Press.
- Creswell, J.W., (2007). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (2nd ed.). Sage, Thousand-Oaks, CA.
- Crossman, J. (Ed.), (2001). *Coping with sports injuries: Psychological strategies for rehabilitation*. UK: Oxford University Press.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Thousand Oaks, CA: Sage.
- D'Hemecourt, P. (2011). Subacute symptoms of sports-related concussion: outpatient management and return to play. *Clin. Sports Med.* 30:63–72.
- Doolan, A. W., Day, D. D., Maerlender, A. C., Goforth, M., & Brolinson, P.G. (2012). A review of return to play issues and sports-related concussion. *Annals of*

Biomedical Engineering, 40(1), 106-113.

Duff, M. C. (2009). Management of sports-related concussion in children and adolescents. *The ASHA Leader*, 14(9), 10–13.

Echlin, P.S. (2012). A prospective study of physician-observed concussion during a varsity university ice hockey season. *Neurosurg Focus*, 33(6)

Echemendia, J. R., & Cantu, C. R. (2003). Return to play following sports-related mild traumatic brain injury: The role for neuropsychology. *Applied Neuropsychology*, 10(1), 48-55

Ermiler, K. L., & Thomas, C. E. (1990). Interventions for the alienating effect of injury. *Athletic Training*, 25(3), 269-271.

Fish, M. (2012, August 16). A different game in Canada. In *ESPN.com*. Retrieved September 18, 2012

Frisby, W. (1995). Broadening perspectives on leisure service management research: What does organization theory have to offer? *Journal of Park and Recreation Administration*, 13 (1), 58-72.

Giza, C. C., & Hovda, D. A. (2001). The neurometabolic cascade of concussion. *Journal Of Athletic Training*, 36(3), 228-235.

Gould, D. D., Udry, E. E., Bridges, D. D., & Beck, L. L. (1997). Stress sources encountered when rehabilitating from season-ending ski injuries. *Sport Psychologist*, 11(4), 361-378.

Grindel, S. H., Lovell, M. R., & Collins, M. W. (2001). The assessment of sport-related concussion: the evidence behind neuropsychological testing and management.

Clinical Journal Of Sport Medicine, 11(3), 134-143.

Hughes, R. R., & Coakley, J. J. (1991). Positive deviance among athletes: the implications of overconformity to the sport ethic. *Sociology Of Sport Journal*, 8(4), 307-325.

Hutchison, M., Mainwaring, L. M., Comper, P., Richards, D. W., & Bisschop, S. M. (2009). Differential emotional responses of varsity athletes to concussion and musculoskeletal injuries. *Clinical Journal Of Sport Medicine*, 19(1), 13-19.

Johnson, L. M. (2012). Return to play guidelines cannot solve the football-related concussion problem. *Journal Of School Health*, 82(4), 180-185

Katayama, Y., Becker, D.P., Tamura, T., Hovda, D.A. (1990). Massive increases in extracellular potassium and the indiscriminate release of glutamate following concussive brain injury. *J Neurosurg*. 73:889-890.

Kissick, J., & Johnston, K. (2005). Return to play after concussion: Principles and practice. *Clinical Journal of Sport Medicine*, 15(6), 426-431

Kvale, S. (1996). *InterViews: an introduction to qualitative research interviewing*. Sage, Thousands-Oaks, CA.

- Leddy, J. J., Sandhu, H., Sodhi, V., Baker, J. G., & Willer, B. (2012). Rehabilitation of concussion and post-concussion syndrome. *Sports Health: A Multidisciplinary Approach*, 4(2), 147-154
- Lincoln, YS. & Guba, EG. (1985). *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.
- Logan, K. (2010). Recognition and Management of Post-Concussion Syndrome. *Athletic Therapy Today*, 15(3), 4-7.
- Lovell, M. M., Collins, M. M., & Bradley, J. J. (2004). Return to play following sports-related concussion. *Clinics In Sports Medicine*, 23(3), 421-441
- Lovell, M. R., Iverson, G. L., Collins, M. W., Podell, K., Johnston, K. M., Pardini, D., Maroon, J. C. (2006). Measurement of symptoms following sports-related concussion: Reliability and normative data for the post-concussion scale. *Applied Neuropsychology*, 13(3), 166-174.
- Mainwaring, L. M., Bisschop, S. M., Green, R. A., Antoniazzi, M., Comper, P., Kristman, V., Provvidenza, C., & Richards, D. W. (2004). Emotional reaction of varsity athletes to sport-related concussion. *Journal Of Sport & Exercise*.
- Master, C.L., Gioia, G.A., Leddy, J.J., Grady, M.F. (2012). Importance of 'return-to-learn' in pediatric and adolescent concussion. *Pediatr Ann*. 2012;41(9):1-6.
- Meehan III, W. P., Taylor, A. M., & Proctor, M. (2011). The Pediatric Athlete: Younger Athletes with Sport-Related Concussion. *Clinics In Sports Medicine*, 30(1), 133-144.
- McCrory, P., Meeuwisse, W., Johnston, K., Dvorak, J., Aubry, M., Molloy, M., & Cantu,

- R. (2009). Consensus statement on concussion in sport: the 3rd international conference on concussion in sport held in Zurich, November 2008 *Clinical Journal Sports Med*, 19(3), 185-200
- McCrory, P., Meeuwisse, W., Aubry, M., Cantu, B., Dvorak, J., Echemendia, R., & ...
 McCrea, M. (2013). Consensus statement on Concussion in Sport - The 4th International Conference on Concussion in Sport held in Zurich, November 2012. *Physical Therapy In Sport*, 14(2), e1-e13.
- McDaniel, L. W., & McIntire, K. (2010). Neurocognitive performance: Returning to competition. *International Education Studies*, 3(3), 137-140
- McLellan, T. L., & McKinlay, A. (2011). Does the way concussion is portrayed affect public awareness of appropriate concussion management: the case of rugby league. *British Journal Of Sports Medicine*, 45(12), 993-996
- Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks: Sage.
- Patton, M.Q., (2002). *Qualitative Evaluation and Research Methods* (3rd ed.). Sage, Thousands-Oaks, CA.
- Patton, M.Q., (1990). *Qualitative Evaluation and Research Methods* (2nd ed.). Sage, Thousands-Oaks, CA.
- Putukian, M. M., Aubry, M. M., & McCrory, P. P. (2009). Return to play after sports concussion in elite and non-elite athletes?. *British Journal Of Sports Medicine*, 43i28-i31.
- Podlog, L., & Eklund, R. C. (2004). Assisting injured athletes with the return to sport transition. (Editorial). *Clinical Journal Of Sport Medicine*, 14(5), 257-259

- Randolph, C., & Kirkwood, M. W. (2009). What are the real risks of sport-related concussion, and are they modifiable? *Journal Of The International Neuropsychological Society*, 15(4), 512-520
- Rossmann, G.B., & Rallis, S.F. (2003). *Learning in the field: An introduction to qualitative research*. Thousand Oaks, CA: Sage.
- Ryan, R.M., & Deci, E. L. (2000) Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychology*, 55:68–78.
- Sedney, C. L., J. Orphanos, & J. E. Bailes. (2011). When to consider retiring an athlete after sports-related concussion. *Clin. Sports Med.* 30:189–200
- Tator, C. H. (2014). Chronic traumatic encephalopathy: How serious a sports problem is it?. *British Journal Of Sports Medicine*, 48(2), 1-3.
- Theodorakis, Y.Y., Beneca, A. A., Malliou, P. P., & Goudas, M. M. (1997). Examining psychological factors during injury rehabilitation. *Journal Of Sport Rehabilitation*, 6(4), 355-363.
- Tracey, J. (2003). The emotional response to the injury and rehabilitation process. *Journal Of Applied Sport Psychology*, 15(4), 279-293.
- Unknown. (2012, May 10). Jacob bell retires with health intact. In *ESPN.com*. Retrieved September 18, 2012
- Van Manen, M. (1990). *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy*. State University of New York Press
- Wagman, D., & Khelifa, M. (1996). Psychological issues in sport injury rehabilitation: current knowledge and practise. *Journal of Athletic Training*, 31(3), 257-261

Williams, J. (2006) *Applied sport psychology: Personal growth to peak performance*.

New York: McGraw-Hill; 2006

Willis, J.W., Jost, M & Nilakanta, R. (2007). *Foundations of Qualitative Research:*

Interpretive and Critical Approaches. Sage, Thousand-Oaks, CA.

Wojtys, E. M., Hovda, D. D., Landry, G. G., Boland, A. A., Lowell, M. M., McCrea, M.

M., & Minkoff, J. J. (1999). Concussion in sports. *American Journal Of Sports Medicine*, 27(5), 676-687

Young, K., & White, P. (1995). Sport, physical danger and injury: The experiences of

elite women athletes. *Journal of Sport and Social Issues*, 19:45-61

APPENDIX A

SPORT CONCUSSION ASSESSMENT TOOL 2 (SCAT2)

SCAT2

Sport Concussion Assessment Tool 2



Name _____

Sport/team _____

Date/time of injury _____

Date/time of assessment _____

Age _____ Gender ☐ M ☐ F

Years of education completed _____

Examiner _____

What is the SCAT2?

This tool represents a standardized method of evaluating injured athletes for concussion and can be used in athletes aged from 10 years and older. It supersedes the original SCAT published in 2005². This tool also enables the calculation of the Standardized Assessment of Concussion (SAC)^{3,4} score and the Maddocks questions⁵ for sideline concussion assessment.

Instructions for using the SCAT2

The SCAT2 is designed for the use of medical and health professionals. Preseason baseline testing with the SCAT2 can be helpful for interpreting post-injury test scores. Words in *italics* throughout the SCAT2 are the instructions given to the athlete by the tester.

This tool may be freely copied for distribution to individuals, teams, groups and organizations.

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific symptoms (like those listed below) and often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (such as headache), or
- Physical signs (such as unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour.

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle.

Symptom Evaluation**How do you feel?**

You should score yourself on the following symptoms, based on how you feel now.

	none	mild		moderate		severe	
Headache	0	1	2	3	4	5	6
“Pressure in head”	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like “in a fog”	0	1	2	3	4	5	6
“Don’t feel right”	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22) _____

Symptom severity score

(Add all scores in table, maximum possible: 22 x 6 = 132) _____

Do the symptoms get worse with physical activity? ☐ Y ☐ N
Do the symptoms get worse with mental activity? ☐ Y ☐ N

Overall rating

If you know the athlete well prior to the injury, how different is the athlete acting compared to his / her usual self? Please circle one response.

☐ no different ☐ very different ☐ unsure

Cognitive & Physical Evaluation

1 Symptom score (from page 1)
22 **minus** number of symptoms of 22

2 Physical signs score
Was there loss of consciousness or unresponsiveness? ☐ Y ☐ N
If yes, how long? minutes
Was there a balance problem/unsteadiness? ☐ Y ☐ N
Physical signs score (1 point for each negative response) of 2

3 Glasgow coma scale (GCS)
Best eye response (E)
No eye opening 1
Eye opening in response to pain 2
Eye opening to speech 3
Eyes opening spontaneously 4
Best verbal response (V)
No verbal response 1
Incomprehensible sounds 2
Inappropriate words 3
Confused 4
Oriented 5
Best motor response (M)
No motor response 1
Extension to pain 2
Abnormal flexion to pain 3
Flexion/Withdrawal to pain 4
Localizes to pain 5
Obeys commands 6
Glasgow Coma score (E + V + M) of 15
GCS should be recorded for all athletes in case of subsequent deterioration.

4 Sideline Assessment – Maddocks Score
"I am going to ask you a few questions, please listen carefully and give your best effort."
Modified Maddocks questions (1 point for each correct answer)
At what venue are we at today? 0 1
Which half is it now? 0 1
Who scored last in this match? 0 1
What team did you play last week/game? 0 1
Did your team win the last game? 0 1
Maddocks score of 5
Maddocks score is validated for sideline diagnosis of concussion only and is not included in SCAT 2 summary score for serial testing.

5 Cognitive assessment
Standardized Assessment of Concussion (SAC)

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
Orientation score	of 5	

Immediate memory

"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:

"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. Score 1 pt. for each correct response. Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

List	Trial 1	Trial 2	Trial 3	Alternative word list		
elbow	0 1	0 1	0 1	candle	baby	finger
apple	0 1	0 1	0 1	paper	monkey	penny
carpet	0 1	0 1	0 1	sugar	perfume	blanket
saddle	0 1	0 1	0 1	sandwich	sunset	lemon
bubble	0 1	0 1	0 1	wagon	iron	insect
Total						

Immediate memory score of 15

Concentration

Digits Backward:

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."

If correct, go to next string length. If incorrect, read trial 2. One point possible for each string length. Stop after incorrect on both trials. The digits should be read at the rate of one per second.

			Alternative digit lists		
4-9-3	0 1	6-2-9	5-2-6	4-1-5	
3-8-1-4	0 1	3-2-7-9	1-7-9-5	4-9-6-8	
6-2-9-7-1	0 1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3	
7-1-8-4-6-2	0 1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6	

Months in Reverse Order:

"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"

1 pt. for entire sequence correct

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan 0 1

Concentration score of 5

¹ This tool has been developed by a group of international experts at the 3rd International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2008. The full details of the conference outcomes and the authors of the tool are published in British Journal of Sports Medicine, 2009, volume 43, supplement 1. The outcome paper will also be simultaneously co-published in the May 2009 issues of Clinical Journal of Sports Medicine, Physical Medicine & Rehabilitation, Journal of Athletic Training, Journal of Clinical Neuroscience, Journal of Science & Medicine in Sport, Neurosurgery, Scandinavian Journal of Science & Medicine in Sport and the Journal of Clinical Sports Medicine.

² McCrory P et al. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine. 2005; 39: 196-204

³ McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sports Medicine. 2001; 11: 176-181

⁴ McCrea M, Randolph C, Kelly J. Standardized Assessment of Concussion: Manual for administration, scoring and interpretation. Waukesha, Wisconsin, USA.

⁵ Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32-3

⁶ Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30

6 Balance examination

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁶. A stopwatch or watch with a second hand is required for this testing.

Balance testing

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances."

(a) Double leg stance:

"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."

(b) Single leg stance:

"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

(c) Tandem stance:

"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

Which foot was tested: ☐ Left ☐ Right
(i.e. which is the **non-dominant** foot)

Condition	Total errors
Double Leg Stance (feet together)	of 10
Single leg stance (non-dominant foot)	of 10
Tandem stance (non-dominant foot at back)	of 10
Balance examination score (30 minus total errors)	of 30

7 Coordination examination

Upper limb coordination

Finger-to-nose (FTN) task: "I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."

Which arm was tested: ☐ Left ☐ Right

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. Failure should be scored as 0.

Coordination score

of 1

8 Cognitive assessment

Standardized Assessment of Concussion (SAC)

Delayed recall

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Circle each word correctly recalled. Total score equals number of words recalled.

List	Alternative word list		
elbow	candle	baby	finger
apple	paper	monkey	penny
carpet	sugar	perfume	blanket
saddle	sandwich	sunset	lemon
bubble	wagon	iron	insect

Delayed recall score

of 5

Overall score

Test domain	Score
Symptom score	of 22
Physical signs score	of 2
Glasgow Coma score (E + V + M)	of 15
Balance examination score	of 30
Coordination score	of 1
Subtotal	of 70
Orientation score	of 5
Immediate memory score	of 5
Concentration score	of 15
Delayed recall score	of 5
SAC subtotal	of 30
SCAT2 total	of 100
Maddocks Score	of 5

Definitive normative data for a SCAT2 "cut-off" score is not available at this time and will be developed in prospective studies. Embedded within the SCAT2 is the SAC score that can be utilized separately in concussion management. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in neurological functioning.

Scoring data from the SCAT2 or SAC should not be used as a stand alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.

Athlete Information

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

Signs to watch for

Problems could arise over the first 24-48 hours. You should not be left alone and must go to a hospital at once if you:

- Have a headache that gets worse
- Are very drowsy or can't be awakened (woken up)
- Can't recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused; are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on your feet; have slurred speech

Remember, it is better to be safe.

Consult your doctor after a suspected concussion.

Return to play

Athletes should not be returned to play the same day of injury.

When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:

1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages.

Medical clearance should be given before return to play.

Tool	Test domain	Time	Score
		Date tested	
		Days post injury	
SCAT2	Symptom score		
	Physical signs score		
	Glasgow Coma score (E + V + M)		
	Balance examination score		
	Coordination score		
	Orientation score		
	Immediate memory score		
	Concentration score		
	Delayed recall score		
	SAC Score		
Total	SCAT2		
Symptom severity score (max possible 132)			
Return to play			<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Y <input type="checkbox"/> N

Additional comments

Concussion injury advice (To be given to concussed athlete)

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

If you notice any change in behaviour, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please telephone the clinic or the nearest hospital emergency department immediately.

Other important points:

- Rest and avoid strenuous activity for at least 24 hours
- No alcohol
- No sleeping tablets
- Use paracetamol or codeine for headache. Do not use aspirin or anti-inflammatory medication
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

Clinic phone number

Patient's name

Date/time of injury

Date/time of medical review

Treating physician

Contact details or stamp

Pocket SCAT2

Pocket SCAT2



Concussion should be suspected in the presence of **any one or more** of the following: symptoms (such as headache), or physical signs (such as unsteadiness), or impaired brain function (e.g. confusion) or abnormal behaviour.

1. Symptoms

Presence of any of the following signs & symptoms may suggest a concussion.

- | | |
|-------------------------|----------------------------|
| ▪ Loss of consciousness | ▪ Feeling slowed down |
| ▪ Seizure or convulsion | ▪ Feeling like "in a fog" |
| ▪ Amnesia | ▪ "Don't feel right" |
| ▪ Headache | ▪ Difficulty concentrating |
| ▪ "Pressure in head" | ▪ Difficulty remembering |
| ▪ Neck Pain | ▪ Fatigue or low energy |
| ▪ Nausea or vomiting | ▪ Confusion |
| ▪ Dizziness | ▪ Drowsiness |
| ▪ Blurred vision | ▪ More emotional |
| ▪ Balance problems | ▪ Irritability |
| ▪ Sensitivity to light | ▪ Sadness |
| ▪ Sensitivity to noise | ▪ Nervous or anxious |

2. Memory function

Failure to answer all questions correctly may suggest a concussion.

"At what venue are we at today?"

"Which half is it now?"

"Who scored last in this game?"

"What team did you play last week / game?"

"Did your team win the last game?"

3. Balance testing

Instructions for tandem stance

*"Now stand heel-to-toe with your **non-dominant** foot in back. Your weight should be evenly distributed across both feet. You should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."*

Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more than 5 seconds) then this may suggest a concussion.

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, urgently assessed medically, should not be left alone and should not drive a motor vehicle.

APPENDIX B

ONE CANADIAN UNIVERSITY'S RETURN TO PLAY GUIDELINES

RETURN TO PLAY GUIDELINES



A concussion is a serious event, but you can recover fully from such an injury if the brain is given enough time to rest and recuperate. Returning to normal activities, including sport participation, is a step-wise process that requires patience, attention, and caution.

STEP 1: NO ACTIVITY, ONLY COMPLETE REST.

Limit school, work and tasks requiring concentration. Refrain from physical activity until symptoms are gone. Once symptoms are gone, a physician, preferably one with experience managing concussions, should be consulted before beginning a step wise return to play process.

STEP 2: LIGHT AEROBIC EXERCISE.

Activities such as walking or stationary cycling. The player should be supervised by someone who can help monitor for symptoms and signs. No resistance training or weight lifting. The duration and intensity of the aerobic exercise can be gradually increased over time if no symptoms or signs return during the exercise or the next day.

SYMPTOMS? Return to rest until symptoms have resolved.
If symptoms persist, consult a physician.

NO SYMPTOMS? Proceed to **Step 3** the next day.

STEP 3: SPORT SPECIFIC ACTIVITIES.

Activities such as skating or throwing can begin at step 3. There should be no body contact or other jarring motions such as high speed stops or hitting a baseball with a bat.

SYMPTOMS? Return to rest until symptoms have resolved.
If symptoms persist, consult a physician.

NO SYMPTOMS? Proceed to **Step 4** the next day.

STEP 4: BEGIN DRILLS WITHOUT BODY CONTACT.

SYMPTOMS? Return to rest until symptoms have resolved.
If symptoms persist, consult a physician.

NO SYMPTOMS? The time needed to progress from non-contact exercise will vary with the severity of the concussion and with the player. **Proceed to Step 5 only after medical clearance.**

STEP 5: BEGIN DRILLS WITH BODY CONTACT.

SYMPTOMS? Return to rest until symptoms have resolved.
If symptoms persist, consult a physician.

NO SYMPTOMS? Proceed to **Step 6** the next day.

STEP 6: GAME PLAY.

www.thinkfirst.ca
Before you Return to Play!

The ThinkFirst Canada Concussion resources were developed based on the Zurich Guidelines outlined in the Consensus Statement on Concussion in Sport and have been reviewed with great thanks to the ThinkFirst Concussion Education and Awareness Committee.

RETURN TO PLAY GUIDELINES



NEVER RETURN TO PLAY IF YOU STILL HAVE SYMPTOMS!

A player who returns to active play before full recovery from the first concussion is at high risk of sustaining another concussion, with symptoms that may be increased and prolonged.

HOW LONG DOES THIS PROCESS TAKE?

These steps do not correspond to days! It may take many days to progress through one step, especially if the concussion is severe. As soon as symptoms appear, the player should return to rest until symptoms have resolved and wait at least one more day before attempting any activity. The only way to heal a brain is to rest it.

HOW DO I FIND THE RIGHT DOCTOR?

When dealing with concussions, it is important to see a doctor who is knowledgeable in concussion management. This might include your physician or someone such as a sports medicine specialist. Your family doctor maybe required to submit a referral to see a specialist. Contact the Canadian Academy of Sport and Exercise Medicine (CASEM) to find a sports medical physician in your area. Visit www.casm-acms.org for more information. You can also refer your doctor to the concussion pages of thinkfirst.ca for more information.

WHO DO THESE GUIDELINES APPLY TO?

These guidelines were developed for children over the age of 10; those younger may require special guidelines, and more conservative treatment and care. Return to Play Guidelines should be at the discretion of the physician.

WHAT IF MY SYMPTOMS RETURN DURING THIS PROCESS?

Sometimes these steps can cause symptoms of a concussion to return. This means that the brain has not yet healed, and needs more rest. If any signs or symptoms return during the Return To Play process, they should stop the activity and rest until symptoms have resolved. The player must be re-evaluated by a physician before trying any activity again. Remember, symptoms may return later that day or the next, not necessarily during the activity!

www.thinkfirst.ca
Before you Return to Play!

The ThinkFirst Canada Concussion resources were developed based on the Zurich Guidelines outlined in the Consensus Statement on Concussion in Sport and have been reviewed with great thanks to the ThinkFirst Concussion Education and Awareness Committee.

APPENDIX CECENT CONCUSSION GRADING SCALES: MOST POPULAR

GUIDELINES

Recent Concussion Grading Scales			
Guideline	Grade 1	Grade 2	Grade 3
Cantu	1. No loss of consciousness 2. Posttraumatic amnesia lasts less than 30 min	1. Loss of consciousness lasts longer than 5 minutes OR 2. Posttraumatic amnesia lasts longer than 30 minutes	1. Loss of consciousness lasts longer than 5 minutes OR 2. Posttraumatic amnesia lasts longer than 24 hours
Colorado	1. Confusion without amnesia 2. No loss of consciousness	1. Confusion with amnesia 2. No loss of consciousness	1. Loss of consciousness (of any duration)
American Academy of Neurology	1. Transient confusion 2. No loss of consciousness 3. Concussion symptoms, mental status changes resolve in less than 5 minutes	1. Transient confusion 2. No loss of consciousness 3. Concussion symptoms, mental status changes resolve in less than 15 minutes	1. Loss of consciousness (brief or prolonged)
Cantu (revised)	1. No loss of consciousness OR 2. posttraumatic amnesia, signs/symptoms last longer than 30 minutes	1. Loss of consciousness lasts less than 1 minute OR 2. Posttraumatic amnesia lasts longer than 30 minutes but less than 24 hours	1. Loss of consciousness lasts more than 1 minute OR 2. Posttraumatic amnesia lasts longer than 24 hours OR 3. Post concussion signs or symptoms last longer than 7 days

APPENDIX D

VIENNA CONCUSSION CONFERENCE

Vienna Concussion Conference: return to play recommendations

Athletes should complete the following stepwise process prior to return to play following a concussion:

1. Removal from contest following any signs/symptoms of a concussion
2. No return to play in current game
3. Medical evaluation following injury
 - a. Rule out more serious intracranial pathology
 - b. Neuropsychologic testing (considered a cornerstone of proper post injury assessment)
4. Step wise return to play
 - a. No activity and rest until asymptomatic
 - b. Light aerobic exercise
 - c. Sport specific training
 - d. Noncontact drills
 - e. Full-contact drills
 - f. Game play

APPENDIX E

ONE CANADIAN UNIVERSITY'S CONCUSSION MANAGEMENT PROTOCOL

2012/2013

One Canadian University's Concussion Management protocol 2012/13

1. Athlete has MOI and one sign or symptom of concussion
2. Athlete is removed from activity (take away a vital piece of equipment such as footwear)
3. Inform your co therapist that you will be performing a sideline concussion exam
4. Away from the team administer the sideline concussion exam
5. This is a slightly modified SCAT II (Appendix 1) and is found in your student trainer pocketbook
6. Ideally put the athlete in a quiet room with low lights. Do not leave them unattended.
7. Arrange for a ride home and someone at home to keep an eye on them. No need to wake them up every two hours.
8. Set athlete up to see one of our sports doctors
9. Go over the following instructions for patients with a concussion. When to seek care urgently:
 - a. Headaches worsen, seizures
 - b. Unusual behavior change, very drowsy, cant be woken
 - c. Repeated vomiting, slurred speech, significant irritability
 - d. Cant recognize people or places, increasing confusion
 - e. Weakness, numbness in legs, less responsive then usual

APPENDIX F

3rd INTERNATIONAL CONSENSUS STATEMENT GRADUATED RETURN TO PLAY PROTOCOL

Graduated return to play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% MPHR. No resistance training.	Increase HR
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities.	Add movement
4. Non-contact training drills	Progression to more complex training drills (e.g. passing drills in football and ice hockey). May start progressive resistance training).	Exercise, coordination, cognitive load
5. Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence, assessment of functional skills by coaching staff
6. Return to play	Normal game play	

HR = heart rate, MPHR = maximum predicted heart rate.

APPENDIX G

LETTER OF INVITATION AND CONSENT FORM

Letter of Invitation

Title of Study: Returning to Play after Concussion: A Phenomenological Study

Principal Investigator: Maureen Connolly [supervisor], Department, Brock University

Student Principal Investigator: Kathleen Da Costa, Department, Brock University

I, Maureen Connolly, from the Department of Physical Education and Kinesiology at Brock University, invite you to participate in a research project entitled Returning to Play after Concussion: A Phenomenological Study.

The purpose of this phenomenological **study** is to describe athletes' felt sense of readiness regarding returning to play following a concussion. Should you choose to participate, you will be asked to answer various questions regarding how you felt returning to play following a concussion in the form of an interview process.

In order to complete my research, I need to conduct interviews with athletes who have been diagnosed with a concussion. The initial interview will require 30-45mins. If after the initial interview has been transcribed and it is determined by the researcher that more information is required a follow up interview will be done. The expected duration is 1-3 30-45min interviews. To maintain confidentiality of those involved in this program, they will each chose a pseudonym at the beginning of the first interview.

There are no direct benefits to you from participating in this research. However, you as the participant may be prompted to think differently if another concussion occurred and recognize the importance of not ignoring symptoms to return to play sooner.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905 688-5550 ext 3035, reb@brocku.ca)

If you have any questions or are willing to participate, please feel free to contact myself, the principal student investigator, through e-mail or telephone.

Thank you,
Kathleen Da Costa
M.A. Candidate, Brock University
(905) 808-5020
kd07ua@brocku.ca

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board 11-225.

Informed Consent

Date:

Project Title: Returning to Play after Concussion: A Phenomenological Study

Principal Investigator (PI): Maureen Connolly, Supervisor
Department of Physical Education and Kinesiology
Brock University
(905) 688-5550 X3381
mconnolly@brocku.ca

Student Principal Investigator (SPI): Kathleen Da Costa
Department of Applied Health Science
Brock University
(905) 808-5020
kd07ua@brocku.ca

INVITATION

You are invited to participate in a study that involves research. The purpose of this phenomenological **study** is to describe athletes' felt sense of readiness regarding returning to play following a concussion.

WHAT'S INVOLVED

As a participant, you will be asked to complete 1-3 interviews. Participation will take approximately 30-45 minutes of your time per interview. The initial interview will require 30-45mins. If after the initial interview has been transcribed and it is determined by the researcher that more information is required you will be contacted through email and a follow up interview will be scheduled.

POTENTIAL BENEFITS AND RISKS

There are no direct benefits to you from participating in this research. However, you as the participant may be prompted to think differently if another concussion occurred and stress the importance of not ignoring symptoms to return to play sooner.

We'd like you to be aware of some possible risks of participating, even though the risks are minor. You might worry that we might judge you or inform the coach, trainers, or your team of what is discussed during the interview.

Your descriptions of your experience are valuable for us. We have no judgments about your decisions and we respect your rights to make them. We will not think any less of you. We will remain completely confidential with what is discussed during the interview.

CONFIDENTIALITY

All information you provide is considered confidential. Your name will not be included or in any other way associated with the interview. You will not be identified individually

in any way in written reports of this research. Anonymous quotations will be used with your permission.

Data collected during this study will be stored on a locked computer. All written data will be transferred to a data stick which will be wiped upon completion of the project. Only researchers working on this project will have access to this data. Participants will be given aliases to protect their anonymity and their data will be analyzed with these aliases. Participants will not be identified in any way should findings be published. Participants will be given the opportunity to receive their transcripts following the completion of the study.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available by contacting the principal investigators using the contact information provided above.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact one of us using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University 11-225. If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____ Date: _____

APPENDIX H

INTERVIEW GUIDE

The purpose of this phenomenological study is to describe athletes' felt sense of readiness returning to play following a concussion.

- 1) What sport do you play? How long have you been playing?
- 2) How many concussions have you had?
 - a) Most recent
 - b) When was the first one?
- 3) Describe how you felt after experiencing your first concussion?
- 4) How did this phenomenon impact you?
- 5) How did you know you were ready to return to play after being cleared?
 - a) Tell me more about the "being cleared to play process"
 - b) What procedures were done?
 - c) How did you respond emotionally to the concussion and to the return to play decision?
 - d) How have your emotional responses changed or stayed the same?
 - e) Describe other peoples responses
- 6) What symptoms continued once cleared? (Did you tell anyone? Why, why not?) (Did you hide it? Why?)
 - a) Talk more about the after effects of concussion, like lingering symptoms. What were they and how did you manage them?
 - b) Talk about whether you felt the need to hide or mask your symptoms?
- 7) What feel pressures did you experience regarding return to play (teammates, coaches, playoffs, parent, friends etc) or not retuning to play?
- 8) Talk about your emotions and decision making immediately following a concussion
- 9) Talk about any concussion experiences you have had that were not "caught".

APPENDIX I

EXEMPLAR TRANSCRIPT/ANALYSIS PROCESS

John Interview

K: What sport do you play?

J: Basketball

K: how long have you been playing basketball?

J: uh I first started playing basketball when I was about 6 years old

K: and how long did you play for [REDACTED]?

J: uh I played for [REDACTED] for roughly 2 and a half seasons

K: were you a starter?

J: I was

K: how many concussions have you had?

J: 8

K: when was your first one?

J: my first one would have been in grade 6 was my first diagnosed concussion

K: what happened?

J: um gym class uh I was diving for a loose ball and uh I just kept sliding and hit my head on the wall

K: and when was your next one?

J: my next one after that would have been um grade 9 playing football

K: what about [REDACTED] when was your first one at [REDACTED]?

J: uh my first one at [REDACTED] uh that people know about uh happened in my first year

K: and what happened

J: uh I was just in the key driving to the basket in the key um passed the ball and someone had stepped up and I just hit my head against their elbow

K: and you felt...

J: that one um it was just like not anything crazy it was more like um dizziness slight headache right away um but I kept playing

K: why did you keep playing?

J: um well its just like who I am as a person I just couldn't I cant not play

K: did you tell anyone about it?

J: um nope that one I didn't say anything about because that would that was my fifth one

K: so how was it diagnosed then if you didn't tell anyone about it?

J: I had to go see the doctor um later on uh about 2 weeks later went and saw the doctor for like a check up and uh he diagnosed me

K: so what about your first one at [REDACTED] that you said no one knew about what about that one, when did that one happen?

J: um that's the first one that is the one that no one at [REDACTED] knew about that one

K: ok and then the next one happened how far between that one and the next one happening?

J: um the next one happened in my second year um and that one we were playing that one the trainers did know about we were playing at [REDACTED] and again I was going for a loose ball and uh one of the players on the other team was running by me to get the ball and his knee hit the back of my head and that one was the game stopped trainers had to come on the floor and immediately they uh diagnosed me with having a concussion

K: when was your most recent one?

J: the last one I had was (laughs) the last one I had was February 13th 2010 I believe

K: and what happened in that one

J: we were up at [REDACTED] University um off of a foul shot um off of a foul shot we were both going for a loose ball um player on the other team swung his elbow hit me in the head... unconscious... hospital

K: whole nine yards... how did this phenomenon impact you at the time? At [REDACTED] before the last one

J: um before the last one? Um like it didn't really impact my playing um because I would never change the way that I play um however it was like the school stuff um trying to concentrate in class um I was getting headaches everyday um I would get actually the occasional nosebleed because of it um but basketball wise it didn't really impact me because once the game started it was just kinda the game took over and I like I said I didn't change the way that I played so didn't really have an impact

K: were you having symptoms while you were playing?

J: oh 100%

K: you just played through it?

J: ya the reason why the one the last one was so bad um was um the Wednesday before we went away we were playing [REDACTED] um and I got hit um took me out um did testing uh like they did the uh what is it scat test? Yup so they did that test um now having seven prior to that I knew the answers so I uh cheated the test um I cheated the test which meant the trainers thought I was ok they put me back in the game nothing fortunately in that game happened but then I went back and when I played at [REDACTED] even though it wasn't that big of a hit um my head was already had already been bruised

K: so why did you not say anything after the one on Wednesday? Why did you choose to cheat the test?

J: um 2 reasons... one like I said before um I always just wanted to play um the main reason though was it was getting up to 7-8 concussions and I knew that eventually they were gonna shut me down and not let me play so um by not saying anything I could not do that

K: how did you know you were ready to return to play after being cleared?

J: um I guess when the symptoms went away um now (laughs) I always just played through them anyways

K: so was there ever a time where you were cleared? Like doctors cleared you, but were you ok to go back in? Like symptoms free?

J: Um I would say after, after my first one at [REDACTED] um I actually did like I was symptom free cleared hadn't had one and then the next one the next following ones I never was actually cleared like I was cleared from the standpoint that again I passed the test

K: and that was the only procedure that was done?

J: yes. I still had symptoms I still... and I just played through

K: so the being cleared to play process was just doing this test and if you passed this test you would go back in?

J: um yes actually um until (laughs) until my last one where I no longer was able to play before [REDACTED] didn't actually have a concussion protocol um so athletes who were getting hit it was basically on the student trainer or the head trainers um to decide whether you were ok to go back in during that game actually and then as well in the following games um they they would do tests like the scat tests um but only after my last one when I was a player they didn't actually have anything it was just how I felt how I told them I felt um and then again they said a week without symptoms... well anybody could have symptoms they just say ya I'm good and then you're able to play again so um that was that was essentially the protocol since then [REDACTED] has put in a return to play um but that itself really only entails the actual scat testing and then how the athlete feels um which again could up in the air so

K: how did you emotionally respond to the concussion and the return to play decision?

J: um

K: you can even go with the last one that took you out of the game permanently

J: mmmm... well um I'll go both... um so not playing and having to sit and watch emotionally just drove me crazy so the games that I did that they did know I had a concussion that I had to sit out um I would just go crazy sitting on the bench not being able to play which probably lead to future decisions to cheat the test and continue to play um since my last one its just been an emotional roller coaster um there's uh not playing basketball which is something I've done since I was six years old has kinda changed the way that I looked at life in general um because it was always a constant I was always either going into the gym or preparing myself to play whether it was going to work out or so filling the time has been one of the biggest challenges now coaching helps a lot with that and uh I didn't really have a choice in that matter (laughs) um Brad the head coach [REDACTED] he wouldn't allow me not to be involved with basketball um now that in itself was uh really difficult because for for someone who needs to have basketball in their life um to be around it at that time directly after um was extremely difficult cuz again like I was before I was kinda helpless I wasn't able to help the team I wasn't able to play um slowly um slowly that's changing I've kinda come to terms with it um from a I would say like a doctors stand point um I've had to see several um neurologists doctors as well as therapists um and I have been put on several medications um since the last one um now that is based on my mood the way that it is um I was about um a year after it happened I was diagnosed with being severely depressed um now that again was because of something that was always a constant in my life not knowing what to do um I didn't really know how to operate... its been difficult

K: I bet... describe other peoples responses

J: um well I would say for the most part the people surrounding me like my family um my teammates and the coaching staff at [REDACTED] their happy to see me take care of myself um now at the same time part of them just like me wishes I was still playing and could see me still play but they have been extremely supportive um in the whole process from beginning to end um my mom especially uh has done a great job of giving me my space when I need it um because uh I was living in a student house when it happened and I had to move back home because the “student living” life um isn’t really one for someone with that many concussions and my symptoms were very bad um to the point where I couldn’t sleep so I had to move back home and since I’ve done that she’s um she’s done a really good job of supporting me and making sure that I’m kinda keeping on track with

K: do you still have symptoms?

J: yup everyday I do... yup so I have severe post concussion syndrome um the last time that I was headache free for a week I couldn’t tell ya, ya I couldn’t tell you... now that’s not to say that it hasn’t gotten better... uh because like I would say the first like 5 or 6 months I had to take myself out of school um I couldn’t concentrate in lecture uh even like being in the room with bright lights was just too much so uh anything that was like stimulating my brain was kinda like out of the question to be around so uh ya I dunno its just difficult

K: so um in season when you were still playing did you feel like say when you got diagnosed with a concussion did you feel pressures from teammates and coaches to get back in sooner?

J: uh never really any pressure from teammates or coaches it was just like internalized because like if we weren’t doing well I would have just always assumed that I could I would be able to help the team in any way um now when we were doing well it was the same kinda thing where as I wanted to be a part of the team doing well and everything that was very difficult for sure

K: with concussions not being a seen injury, people cant see it did you feel like any of your teammates thought like hey just play its not a big deal

J: um I would say if anything that was more um like in high school not so much in university because since I came to university I’ve kinda had that I don’t really know how to put it but I would say like a title where as like I’ve been known to have concussions and people know how severe it was so people really never if anything they were the opposite they were make sure don’t go back in or make sure you take the time um now in high school um there wasn’t really there was more the need for me to play because of our team wasn’t very talented (laughs) wasn’t very good um so if I didn’t play along with some of the other teammates we wouldn’t have done well so I from that pressure ya and that wasn’t even really them pressuring me to get back in plying that was just me wanting to get back

K: why did you feel the need to hide or mask your symptoms?

J: um probably for the very reason that I'm in this interview um because if I if I didn't do it more of my concussions would have been diagnosed um and I probably would have stopped playing sports a lot earlier

K: do you have any regrets?

J: um that's difficult to answer because um I don't regret I don't regret not saying anything and continuing to play because that's again as I said that who I am that's not really something I can change um I would say I do regret um I do regret doing it um only because now the outcome and now I know the severity of like I got off pretty lucky like if I had gone back even earlier then I did something worse could have happened or if I had gotten a more severe hit um something worse could have happened but um I wouldn't say I regret hiding it because that's who I am like I just always wanted to play

K: did you have any doubts or worries when you returned to play? Like after the concussion if you were cleared or even if you weren't and you knew you still had symptoms

J: like did I feel like I was going to get hurt?

K: ya were you scared or worried that it would happen again?

J: um maybe subconsciously but I never changed the way that I played so ya it was kinda in the back of my mind but like while the game was going on never really thought about it I was playing and that was it

K: What does it mean to you to be ready to play post concussion? Ideally to you if you were ready to get back into the game what does that mean?

J: um I don't really know what...like what is...

K: like what does it mean to be ready to play after having a concussion?

J: for me? For me it was not being dizzy I could deal with playing with like a headache I could deal with um like loud noises I could deal with all of that but if I was dizzy there was no way that I could play and even I knew that so um that was really my clearance when I was no longer dizzy um then I knew I was I could go back in and play.

K: ok now let me phrase this a little differently now.. in general what do you say it means to be ready to play like how should you really feel?

J: um ok um I would say and again there's no test nothing that can prove this but like symptom free for at least a week at least but that and emotionally ready, physically ready with no symptoms for at least a week now there's no way to judge that because people like myself its athletes in general its just how they are their driven on competition and

wanting to play so there's no unless athletes are 100% truthful with how their feeling and how their bodies are dealing with this their really isn't anything else you can do um you can do all the tests like the scat test and all the other like hand eye coordination tests and stuff like that but even those are only baseline tests that you can pretty much cheat just like I did um the one way that that does stop people from returning to play early is if it is very severe and you cant do the basic baseline testing like counting backwards and stuff like that o that that is probably it's a very and like research has shown it's a very grey area and even when I was trying to return to play um after my 7th one um I had to go see a bunch of doctors and neurologists and I ended up seeing 8 of them um 5 of them said you shouldn't play I should never play again, um 2 of them wouldn't really comment they were like I don't wanna say yes and I don't wanna say no because its more grey it depends on how the individual is feeling and the last one said yes so obviously I took it and played and that's the end of that but um even the doctors that are doing all this research they themselves cant make that decision because again its solely on the athlete and how the body reacts and how that person can portray those symptoms... because athletes lie they sure do

REVELATORY PHRASES AND KEY WORDS

John Interview

- First concussion that people know about
- But I keep playing
- I didn't say anything because it was my fifth concussion
- Never change the way that I play
- Getting headaches everyday
- Game took over
- (were you having symptoms while you were playing?) Oh 100%
- Cheated the test
- Nothing fortunately in that game happened
- Just wanted to play
- Eventually they were going to shut me down
- I always just played through them
- Never was actually cleared
- How I told them I felt
- Emotionally just drove me crazy to sit and watch
- Emotional rollercoaster
- Helpless
- Severely depressed
- It's been difficult
- Happy to see me take care of myself
- Extremely supportive
- Internalized
- If I didn't (hide my symptoms) more of my concussions would have been diagnosed

- I got off pretty lucky
- Subconsciously (worried or scared that it could happen again)
- I was playing and that was it
- I could deal with everything but if I was dizzy there was no way that I could play
- No test, nothing that can prove (concussions)
- Unless athletes are 100% truthful
- Last (doctor) said yes so obviously I took it and played and that's the end of that
- Solely on the athlete and how the body reacts and how that person can portray those symptoms because athletes lie they sure do

MEANING UNITS: JOHN INTERVIEW

MU #	Specific Description	General Description
1	John has been playing basketball since he was 6 years old. He played for [REDACTED] University for 2½ years as a starter.	
2	John has had 8 concussions	1-3: John has been playing basketball since he was 6. He has had 8 concussions his first one was in grade 6.
3	First concussion was in grade 6. He was diving for a loose ball and hit his head on the wall	
4	First one at [REDACTED] that people know about happened in first year. He hit his head against another players elbow.	
5	Symptoms weren't anything crazy. Dizziness, slight headache but he kept playing. He couldn't just not play "Who I am as a person I just can't not play"	4-6: His first university level concussion was his 5 th concussion. He minimized the symptoms and kept playing, feeling he is a person who cannot NOT play. He did not consult medical attention until 2 weeks later.
6	That one he didn't say anything about the concussion because it was his fifth one. He had to see the doctor about two weeks later for a check up and was diagnosed with a concussion	

-
- 7 Following concussion happened in his second year. He was playing at [REDACTED] went for a loose ball and one of the players from the other team ran by him to get the ball and his knee hit the back of John's head. The game stopped and trainers had to come on the floor and he was immediately diagnosed with a concussion.
- 8 Final concussion was February 13th 2010 at [REDACTED] University. John and an opposing player were going after a loose ball after a foul shot. The player from the other team swung his elbow at John's head. He was knocked unconscious and sent to the hospital.
- 9 Before his final concussion, having concussions didn't really impact his playing because he would never change the way he played. Once the game started the game took over. He didn't change the way he played so didn't really have an impact. However, he struggled with the educational aspect of his life. It was difficult for him to concentrate in class. He was getting headaches everyday even to the point of having occasional nosebleeds. 100% experiencing symptoms while playing.
- 7-11:** Continued to have concussions and each got progressively worse, from game stoppage to full unconsciousness. Continued to play and try and "cheat" the readiness criteria. Denying symptoms and confirming his importance to the game. The number of concussions continued to increase and he was aware that if they continued he would be forced to stop playing. This last concussion was a varsity career ending injury.
- 10 Reason why the last one was so bad was because the Wednesday before the trip to [REDACTED] they were playing at [REDACTED] he got hit in the head and was taken out of the game. The trainers did specific tests on him and since he had seven concussions prior to this one he cheated the test which meant the trainers thought he was okay and he was put back into that same game. Fortunately nothing happened during that game. But then once he played at [REDACTED] although it wasn't that big of a hit his head was already bruised from the previous hit.
-

11 He chose to cheat the test on the Wednesday for 2 reasons:
 -He always just wants to play and cant sit out
 -Main reason was because it was getting up to his 7th or 8th concussion and knew that eventually they were going to stop him from playing so by not saying anything he could continue to play

12 He considered himself ready to play if the symptoms just went away however he would just play through them anyway.

13 After his initial concussion at [REDACTED] University he was symptom free and cleared to play. However, the next following ones he never was actually cleared only at the stand point that he passed the tests but he still had symptoms just played through them

12-13: Only after his first concussion he was cleared to play. With the others he was never truly cleared and always played through symptoms.

14 Until his last concussion where he was no longer able to play basketball, [REDACTED] didn't actually have a concussion protocol. So athletes who were getting hit was basically on the student trainer and athletic therapists to decide whether you were okay to go back in during the game. They would do some tests like the scat tests. When he was a player they didn't actually have anything it was just how he felt and what he told them he felt. They would say a week without symptoms but anyone could have symptoms and just lie to be able to play. Since then [REDACTED] university has put in a return to play process but then again its up in the air depending what the athlete actually says.

14: Concussion protocol is a new development. Return to play relied solely on the athlete and how he/she decided to report their symptoms.

15 Not playing and having to sit and watch emotionally drove him crazy. According to John this is what probably lead to his future decisions to cheat the test and continue to play with symptoms. Since his last concussion it has been an emotional roller coaster

16 He has been playing basketball since he was six years old and not playing basketball has changed the way he looks at life. Basketball was always a constant in his life; he was always either going to the gym or preparing himself to play. Filling the time has been one of his biggest challenges.

17 Coaching helps even though he didn't even have a choice in the matter. His coach [REDACTED] wouldn't allow him to not be involved with basketball. That in itself was very difficult for him because for someone who needs basketball in their life, to be around it so soon after the incident and not to be able to participate was extremely difficult. He felt helpless that he wasn't able to help the team by playing. He is slowly coming to terms with the diagnosis.

18 John has had to see many doctors, therapists and neurologists. He has been put on several medications since his final concussion because of his mood. One year after the concussion he was diagnosed with being severely depressed because he lost a big part of his life and not knowing what to do now that it was gone. He didn't know how to operate, it's been a difficult process for him.

15-21: In spite of others support, he still feels that he has lost his identity and feels as though he has disappointed everyone. Developing depression-like symptoms and changes in mood. Coaching helps but he still feels like he could have made a difference if he was able to participate.

19 For the most part other people's responses (family, teammates, coaching staff) have been positive. They are happy to see him take care of himself.

20 Part of his family and friends just like him wish he was still playing

21	They have been extremely supportive throughout the whole process.	
22	His mom has been an especially large part of this process. He had to move back home because the student living isn't for someone with numerous concussion who are still experiencing symptoms. His symptoms were so severe he couldn't sleep or function normally. Since moving back home his mother has done a great job supporting him and keeping him on track.	22-23: A consequence of his concussion was that he was forced to move back home due to the severity of his symptoms. His symptoms are still present and he was diagnosed with severe post concussion syndrome.
23	He has symptoms everyday. He has severe post concussion syndrome. Things have gotten better. The first 5 or 6 months were extremely difficult he had to be removed from school because he was unable to concentrate in lectures, the lights also effected him, any sort of brain stimulation would be out of the question to be around.	
24	Never any pressures from teammates or coaches it was all internalized. If the team wasn't doing well he would assume that he could have made a difference and when they were doing well he wanted to be apart. Very difficult for him to handle.	
25	Ever since he came to university he's had a certain title of being known for having concussions and people understood how severe they were so he never felt pressures from others to return.	24-26: His pressures to return to play were all internalized. He wanted to be apart of their success and thought he could make a difference if they had lost. Others understood the severity of his concussions and expressed to him how important it was to not go back to soon.

26 Teammates and coaches were very supportive. They were always telling him to make sure he didn't go back in and take his time with the recovery process. However, in high school there was more of a pressure to play because his team wasn't very talented and they needed him to play. So he felt pressure to play but not from his teammates but from himself to want to go back in and win.

27 If he didn't hide his symptoms more of his concussions would have been diagnosed and he would have stopped playing sports a lot sooner.

28 He doesn't regret not saying anything or continuing to play because that's who he is, he can't just sit out. Regrets doing it because of the outcome and now he realizes the severity of concussions and realizes that he is very lucky and things could have been worse.

27-29: He doesn't regret his decision to continue to play with symptoms because that's who he is. He knew if he came forward that he would be forced to sit out. The concussion was at the back of his mind while he played but the game took over. He now realizes the severity of concussions and how lucky he is.

29 Subconsciously he may have been worried or scared but it never affected the way he played. It was in the back of his mind but the game ultimately took over.

30 For him being ready to play after a concussion was not being dizzy, he could deal with playing with a headache and loud noises. He couldn't deal with the dizziness there was no way he could play if he was dizzy so that was his own personal clearance if he wasn't dizzy he could play with all the other symptoms.

31 In general what it means to be cleared is symptom free for at least a week and to be emotionally ready, physically ready with no symptoms. According to John there is no test that can actually prove this because athletes lie. It's how they are driven. They drive on competition and wanting to play so there's no test unless athletes are 100% truthful

30-34: Being ready to play means being symptom free, emotionally ready and physically ready. However, for John as long as he wasn't experiencing the symptom of dizziness he would play through all other symptoms. Athletes will lie because they are driven on competition. Return to play relies solely on the athlete and how they are able to portray their symptoms.

32 You can do all the tests such as the scat test or the hand eye coordination tests but even those you are able to cheat just like he did. The only way these tests work are if the concussions are severe enough that you can't do the basic tests.

33 When John was trying to return to play after his 7th concussion he ended up seeing 8 doctors. 5 of them said he shouldn't play again, 2 of them wouldn't comment, and the last one said yes. So he took that and played and that was the end of that.

-
- 34 Even the doctors that are doing all the research cant make the decision because it solely relies on the athlete and how they react to concussions and how they portray those symptoms because athletes lie.
-

SPECIFIC DESCRIPTION SUMMARY: JOHN INTERVIEW

John has been playing basketball since he was 6 years old. He played for an [REDACTED] University for 2½ years as a starter. John has had 8 concussions. First concussion was in grade 6. First one in university that people know about happened in first year. Symptoms weren't anything crazy. Dizziness, slight headache but he kept playing. That one he didn't say anything about the concussion because it was his fifth one.

He had to see the doctor about two weeks later for a check up and was diagnosed with a concussion. His following concussion happened in his second year. His final concussion was February 13th 2010 in [REDACTED]. He was knocked unconscious and sent to the hospital.

Before his final concussion, having concussions didn't really impact his playing because he would never change the way he played. Once the game started the game took over. He didn't change the way he played so didn't really have an impact. However, he struggled with the educational aspect of his life. It was difficult for him to concentrate in class. He was getting headaches everyday even to the point of having occasional nosebleeds.

Reason why the last one was so bad was because the Wednesday before the trip to [REDACTED] they were playing in [REDACTED] he got hit in the head and was taken out of the game. The trainers did specific tests on him and since he had seven concussions prior to this one he was familiar with the test and cheated the test, which meant the trainers thought he was okay and he was put back into that same game. Fortunately nothing happened during that game.

The main reason way he didn't say anything was because it was getting up to his 7th or 8th concussion and knew that eventually they were going to stop him from playing. By not saying anything he could continue to play. He considered himself ready to play if the symptoms just went away however he would just play through them anyway.

Until his last concussion where he was no longer able to play basketball, his university didn't actually have a concussion protocol. They would say a week without symptoms but according to John anyone could have symptoms and just lie to be able to play. Since then the University has put in a return to play process.

Since his last concussion it has been an emotional roller coaster. He has been playing basketball since he was six years old and not playing basketball has changed the way he looks at life. Basketball was always a constant in his life; he was always either going to the gym or preparing himself to play. Filling the time has been one of his biggest challenges. Coaching helps even though he didn't even have a choice in the matter. His

coach wouldn't allow him to not be involved with basketball. He felt helpless that he wasn't able to help the team by playing. He is slowly coming to terms with the diagnosis. One year after the concussion he was diagnosed with being severely depressed because he lost a big part of his life and not knowing what to do now that it was gone.

For the most part other people's responses (family, teammates, coaching staff) have been positive. They are happy to see him take care of himself. Part of his family and friends just like him wish he was still playing but they have been extremely supportive throughout the whole process. He has symptoms everyday. He has severe post concussion syndrome. However, things have gotten better. The first 5 or 6 months were extremely difficult he had to be removed from school because he was unable to concentrate in lectures, any sort of brain stimulation would be out of the question to be around. He never experienced any pressures from teammates or coaches to return to play it was all internalized. If the team wasn't doing well he would assume that he could have made a difference and when they were doing well he wanted to be apart of the teams success.

If he didn't hide his symptoms more of his concussions would have been diagnosed and he would have been forced to stop playing sports a lot sooner. He doesn't regret not saying anything and continuing to play because that's who he is, he can't just sit out. He only regrets doing it because of the outcome. He now realizes the severity of concussions and realizes that he is very lucky and things could have been worse.

Subconsciously the concussion was in the back of his mind while he was playing but the game ultimately took over. For him being ready to play after a concussion was not being dizzy. He could deal with playing with a headache and loud noises but he couldn't deal with the dizziness. There was no way he could play if he was dizzy so that was his own personal clearance to play.

In general for John being cleared to play is being symptom free for at least a week, to be emotionally ready, and physically ready with no symptoms. According to John there is no test that can actually prove this because athletes lie. It's how they are driven. They drive on competition and wanting to play so there's no true test unless athletes are 100% truthful. Even the doctors that are doing all the research on concussions can't make the decision of when to return to play because it solely relies on the athlete and how they portray those symptoms since athletes will lie to return to play sooner.

GENERAL DESCRIPTIVE SUMMARY: JOHN INTERVIEW

John has been playing basketball since he was 6. He has had 8 concussions, with his first in grade 6. His first university level concussion was his 5th concussion. He minimized the symptoms and kept playing, feeling he is a person who cannot NOT play. He did not consult medical attention until 2 weeks later. He continued to have concussions and each got progressively worse, from game stoppage to full unconsciousness. He continued to play and tried to “cheat” the readiness criteria by denying symptoms and confirming his importance to the game. The number of concussions continued to increase and he was aware that if they continued he would be forced to stop playing. This last concussion was a varsity career ending injury. Only after his first concussion he was cleared to play. With the others he was never truly cleared and always played through symptoms. The concussion protocol was a new development. Return to play relied solely on the athlete and how he/she decided to report their symptoms. In spite of other’s support, he still feels that he has lost his identity and feels as though he has disappointed everyone. He developed depression-like symptoms and changes in mood. Coaching helps but he still feels like he could have made a difference if he was able to participate. A consequence of his concussion was that he was forced to move back home due to the severity of his symptoms. His symptoms are still present and he was diagnosed with severe post concussion syndrome. His pressures to return to play were all internalized. He wanted to be a part of their success and thought he could make a difference if they had lost. Others understood the severity of his concussions and expressed to him how important it was to not go back too soon. He doesn’t regret his decision to continue to play with symptoms because that’s who he is. He knew if he came forward that he would be forced to sit out. The concussion was at the back of his mind while he played but the game took over. He now realizes the severity of concussions and how lucky he is. Being ready to play means being symptom free, emotionally ready and physically ready. However, for John as long as he wasn’t experiencing the symptom of dizziness he would play through all other symptoms. According to John, athletes will lie because they are driven on competition. Return to play relies solely on the athlete and how they are able to portray their symptoms.

APPENDIX J

SCAT3, CHILD SCAT3, POCKET CONCUSSION RECOGNITION TOOL

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SCAT3™



FIFA®



FEI

Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name _____

Date/Time of Injury: _____
Date of Assessment: _____

Examiner: _____

What is the SCAT3?¹

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool³. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g., confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

Any loss of consciousness?	<input type="checkbox"/> Y	<input type="checkbox"/> N
"If so, how long?" _____		
Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?	<input type="checkbox"/> Y	<input type="checkbox"/> N
Disorientation or confusion (inability to respond appropriately to questions)?	<input type="checkbox"/> Y	<input type="checkbox"/> N
Loss of memory:	<input type="checkbox"/> Y	<input type="checkbox"/> N
"If so, how long?" _____		
"Before or after the injury?" _____		
Blank or vacant look:	<input type="checkbox"/> Y	<input type="checkbox"/> N
Visible facial injury in combination with any of the above:	<input type="checkbox"/> Y	<input type="checkbox"/> N

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

2 Maddocks Score³

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1

Maddocks score of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

Notes: Mechanism of Injury ("tell me what happened?"):

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.

BACKGROUND

Name: _____ Date: _____

Examiner: _____

Sport/team/school: _____ Date/time of injury: _____

Age: _____ Gender: ☐ M ☐ F

Years of education completed: _____

Dominant hand: ☐ right ☐ left ☐ neither

How many concussions do you think you have had in the past? _____

When was the most recent concussion? _____

How long was your recovery from the most recent concussion? _____

Have you ever been hospitalized or had medical imaging done for a head injury? ☐ Y ☐ N

Have you ever been diagnosed with headaches or migraines? ☐ Y ☐ N

Do you have a learning disability, dyslexia, ADD/ADHD? ☐ Y ☐ N

Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? ☐ Y ☐ N

Has anyone in your family ever been diagnosed with any of these problems? ☐ Y ☐ N

Are you on any medications? If yes, please list: ☐ Y ☐ N

SCAT3 to be done in resting state. Best done 10 or more minutes post exercise.

SYMPTOM EVALUATION

3 How do you feel?

"You should score yourself on the following symptoms, based on how you feel now".

	none	mild		moderate		severe	
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22)

Symptom severity score (Maximum possible 132)

Do the symptoms get worse with physical activity? ☐ Y ☐ N

Do the symptoms get worse with mental activity? ☐ Y ☐ N

☐ self rated

☐ self rated and clinician monitored

☐ clinician interview

☐ self rated with parent input

Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?

Please circle one response:

☐ no different

☐ very different

☐ unsure

☐ N/A

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

COGNITIVE & PHYSICAL EVALUATION

4 Cognitive assessment

Standardized Assessment of Concussion (SAC)⁴

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1

Orientation score _____ of 5

Immediate memory

List	Trial 1		Trial 2		Trial 3		Alternative word list		
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect
Total									

Immediate memory score total _____ of 15

Concentration: Digits Backward

List		Trial 1				Alternative digit list	
4-9-3	0	1	6-2-9	5-2-6	4-1-5		
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8		
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3		
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6		
Total of 4							

Concentration: Month in Reverse Order (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan ☐ 0 ☐ 1

Concentration score _____ of 5

5 Neck Examination:

Range of motion _____ Tenderness _____ Upper and lower limb sensation & strength _____

Findings: _____

6 Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing⁵

Which foot was tested (i.e. which is the **non-dominant** foot) ☐ Left ☐ Right

Testing surface (hard floor, field, etc.) _____

Condition

Double leg stance: _____ Errors _____

Single leg stance (non-dominant foot): _____ Errors _____

Tandem stance (non-dominant foot at back): _____ Errors _____

And/Or

Tandem gait^{6,7}

Time (best of 4 trials): _____ seconds

7 Coordination examination

Upper limb coordination

Which arm was tested: ☐ Left ☐ Right

Coordination score _____ of 1

8 SAC Delayed Recall⁴

Delayed recall score _____ of 5

INSTRUCTIONS

Words in *italics* throughout the SCAT3 are the instructions given to the athlete by the tester.

Symptom Scale

"You should score yourself on the following symptoms, based on how you feel now".

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

For total number of symptoms, maximum possible is 22.

For Symptom severity score, add all scores in table, maximum possible is $22 \times 6 = 132$.

SAC⁴

Immediate Memory

"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:

"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

Concentration

Digits backward

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

Months in reverse order

"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"

1 pt. for entire sequence correct

Delayed Recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Score 1 pt. for each correct response

Balance Examination

Modified Balance Error Scoring System (BESS) testing⁵

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁵. A stopwatch or watch with a second hand is required for this testing.

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances."

(a) Double leg stance:

"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."

(b) Single leg stance:

"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

(c) Tandem stance:

"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 3 stances can be performed on a surface of medium density foam (e.g., approximately 50 cm x 40 cm x 6 cm).

Tandem Gait^{6,7}

Participants are instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Athletes should complete the test in 14 seconds. Athletes fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.

Coordination Examination

Upper limb coordination

Finger-to-nose (FTN) task:

"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended), pointing in front of you. When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose, and then return to the starting position, as quickly and as accurately as possible."

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
2. McCrory P et al., Consensus Statement on Concussion in Sport – the 3rd International Conference on Concussion in Sport held in Zurich, November 2008. British Journal of Sports Medicine 2009; 43: i76-89.
3. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clinical Journal of Sport Medicine. 1995; 5(1): 32–3.
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6. Schneiders, A.G., Sullivan, S.J., Gray, A., Hammond-Tooke, G. & McCrory, P. Normative values for 16-37 year old subjects for three clinical measures of motor performance used in the assessment of sports concussions. Journal of Science and Medicine in Sport. 2010; 13(2): 196–201.
7. Schneiders, A.G., Sullivan, S.J., Kvarnstrom, J.K., Olsson, M., Yden, T. & Marshall, S.W. The effect of footwear and sports-surface on dynamic neurological screening in sport-related concussion. Journal of Science and Medicine in Sport. 2010; 13(4): 382–386

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

Problems could arise over the first 24–48 hours. The athlete should not be left alone and must go to a hospital at once if they:

- Remember, it is better to be safe.
Consult your doctor after a suspected concussion.

Athletes should not be returned to play the same day of injury. When returning athletes to play, they should be **medically cleared and then follow a stepwise supervised program**, with stages of progression.

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity	Physical and cognitive rest	Recovery
Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity, 70% maximum predicted heart rate. No resistance training	Increase heart rate
Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey. May start progressive resistance training	Exercise, coordination, and cognitive load
Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
Return to play	Normal game play	

If the athlete is symptomatic for more than 10 days, then consultation by a medical practitioner who is expert in the management of concussion, is recommended.

Medical clearance should be given before return to play.

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. Recovery time is variable across individuals and the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

Other important points:

- Rest (physically and mentally), including training or playing sports until symptoms resolve and you are medically cleared
- No alcohol
- No prescription or non-prescription drugs without medical supervision, Specifically:
 - No sleeping tablets
 - Do not use aspirin, anti-inflammatory medication or sedating pain killers
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

Contact details or stamp

Test Domain	Score		
	Date: _____	Date: _____	Date: _____
Number of Symptoms of 22			
Symptom Severity Score of 132			
Orientation of 5			
Immediate Memory of 15			
Concentration of 5			
Delayed Recall of 5			
SAC Total			
BESS (total errors)			
Tandem Gait (seconds)			
Coordination of 1			

Child-SCAT3™



Sport Concussion Assessment Tool for children ages 5 to 12 years

For use by medical professionals only

What is childSCAT3?

The ChildSCAT3 is a standardized tool for evaluating injured children for concussion and can be used in children aged from 5 to 12 years. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively. For older persons, ages 13 years and over, please use the SCAT3. The ChildSCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool. Preseason baseline testing with the ChildSCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the ChildSCAT3 are provided on page 3. If you are not familiar with the ChildSCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision and any reproduction in a digital form require approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The ChildSCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their ChildSCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (like those listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of any one or more of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g., confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more severe brain injury. If the concussed child displays any of the following, then do not proceed with the ChildSCAT3; instead activate emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs
- Persistent vomiting
- Evidence of skull fracture
- Post traumatic seizures
- Coagulopathy
- History of Neurosurgery (eg Shunt)
- Multiple injuries

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the child should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

Any loss of consciousness?	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?"	
Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Disorientation or confusion (inability to respond appropriately to questions)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Loss of memory:	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?"	
"Before or after the injury?"	
Blank or vacant look:	<input type="checkbox"/> Y <input type="checkbox"/> N
Visible facial injury in combination with any of the above:	<input type="checkbox"/> Y <input type="checkbox"/> N

2

Sideline Assessment – child-Maddocks Score³

"I am going to ask you a few questions, please listen carefully and give your best effort."
Modified Maddocks questions (1 point for each correct answer)

Where are we at now?	0	1
Is it before or after lunch?	0	1
What did you have last lesson/class?	0	1
What is your teacher's name?	0	1
child-Maddocks score		of 4

Child-Maddocks score is for sideline diagnosis of concussion only and is not used for serial testing.

Any child with a suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration (i.e., should not be left alone). No child diagnosed with concussion should be returned to sports participation on the day of injury.

BACKGROUND

Name: _____ Date/Time of Injury: _____
 Examiner: _____ Date of Assessment: _____
 Sport/team/school: _____
 Age: _____ Gender: ☐ M ☐ F
 Current school year/grade: _____
 Dominant hand: ☐ right ☐ left ☐ neither
 Mechanism of Injury ("tell me what happened"): _____

For Parent/carer to complete:

How many concussions has the child had in the past? _____
 When was the most recent concussion? _____
 How long was the recovery from the most recent concussion? _____
 Has the child ever been hospitalized or had medical imaging done (CT or MRI) for a head injury? ☐ Y ☐ N
 Has the child ever been diagnosed with headaches or migraines? ☐ Y ☐ N
 Does the child have a learning disability, dyslexia, ADD/ADHD, seizure disorder? ☐ Y ☐ N
 Has the child ever been diagnosed with depression, anxiety or other psychiatric disorder? ☐ Y ☐ N
 Has anyone in the family ever been diagnosed with any of these problems? ☐ Y ☐ N
 Is the child on any medications? If yes, please list: ☐ Y ☐ N

SYMPTOM EVALUATION

3

Child report

Name:	never	rarely	sometimes	often
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I have problems following directions	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20)

Symptom severity score (Maximum possible 20 x 3 = 60)

☐ self rated ☐ clinician interview ☐ self rated and clinician monitored

4

Parent report

The child	never	rarely	sometimes	often
has trouble sustaining attention	0	1	2	3
is easily distracted	0	1	2	3
has difficulty concentrating	0	1	2	3
has problems remembering what he/she is told	0	1	2	3
has difficulty following directions	0	1	2	3
tends to daydream	0	1	2	3
gets confused	0	1	2	3
is forgetful	0	1	2	3
has difficulty completing tasks	0	1	2	3
has poor problem solving skills	0	1	2	3
has problems learning	0	1	2	3
has headaches	0	1	2	3
feels dizzy	0	1	2	3
has a feeling that the room is spinning	0	1	2	3
feels faint	0	1	2	3
has blurred vision	0	1	2	3
has double vision	0	1	2	3
experiences nausea	0	1	2	3
gets tired a lot	0	1	2	3
gets tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20)

Symptom severity score (Maximum possible 20 x 3 = 60)

Do the symptoms get worse with physical activity? ☐ Y ☐ N

Do the symptoms get worse with mental activity? ☐ Y ☐ N

☐ parent self rated ☐ clinician interview ☐ parent self rated and clinician monitored

Overall rating for parent/teacher/coach/carer to answer.

How different is the child acting compared to his/her usual self?

Please circle one response:

☐ no different ☐ very different ☐ unsure ☐ N/A

Name of person completing Parent-report: _____

Relationship to child of person completing Parent-report: _____

Scoring on the ChildSCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.

COGNITIVE & PHYSICAL EVALUATION

5

Cognitive assessment

Standardized Assessment of Concussion – Child Version (SAC-C)*

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1

Orientation score _____ of 4

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list
elbow	0 1	0 1	0 1	candle baby finger
apple	0 1	0 1	0 1	paper monkey penny
carpet	0 1	0 1	0 1	sugar perfume blanket
saddle	0 1	0 1	0 1	sandwich sunset lemon
bubble	0 1	0 1	0 1	wagon iron insect

Total _____

Immediate memory score total _____ of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list
6-2	0 1	5-2 4-1 4-9
4-9-3	0 1	6-2-9 5-2-6 4-1-5
3-8-1-4	0 1	3-2-7-9 1-7-9-5 4-9-6-8
6-2-9-7-1	0 1	1-5-2-8-6 3-8-5-2-7 6-1-8-4-3
7-1-8-4-6-2	0 1	5-3-9-1-4-8 8-3-1-9-6-4 7-2-4-8-5-6

Total of 5 _____

Concentration: Days in Reverse Order (1 pt. for entire sequence correct)

Sunday-Saturday-Friday-Thursday-Wednesday-Tuesday-Monday	0	1
--	---	---

Concentration score _____ of 6

6

Neck Examination:

Range of motion _____ Tenderness _____ Upper and lower limb sensation & strength _____

Findings: _____

7

Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing⁵

Which foot was tested (i.e. which is the **non-dominant** foot) ☐ Left ☐ Right

Testing surface (hard floor, field, etc.) _____

Condition

Double leg stance: _____ Errors

Tandem stance (non-dominant foot at back): _____ Errors

Tandem gait^{6,7}

Time taken to complete (best of 4 trials): _____ seconds

If child attempted, but unable to complete tandem gait, mark here ☐

8

Coordination examination

Upper limb coordination

Which arm was tested: ☐ Left ☐ Right

Coordination score _____ of 1

9

SAC Delayed Recall⁴

Delayed recall score _____ of 5

Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

INSTRUCTIONS

Words in *Italics* throughout the ChildSCAT3 are the instructions given to the child by the tester.

Sideline Assessment – child-Maddocks Score

To be completed on the sideline/in the playground, immediately following concussion. There is no requirement to repeat these questions at follow-up.

Symptom Scale⁸

In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

On the day of injury

- the child is to complete the Child Report, according to how he/she feels now.

On all subsequent days

- the child is to complete the Child Report, according to how he/she feels today, **and**
- the parent/carer is to complete the Parent Report according to how the child has been over the previous 24 hours.

Standardized Assessment of Concussion – Child Version (SAC-C)⁴

Orientation

Ask each question on the score sheet. A correct answer for **each question scores 1 point**. If the child does not understand the question, gives an incorrect answer, or no answer, then the score for that question is 0 points.

Immediate memory

"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:

"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the child that delayed recall will be tested.

Concentration

Digits Backward:

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1, you would say 1-7."

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

Days in Reverse Order:

"Now tell me the days of the week in reverse order. Start with Sunday and go backward. So you'll say Sunday, Saturday ... Go ahead"

1 pt. for entire sequence correct

Delayed recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Circle each word correctly recalled, **Total score equals number of words recalled.**

Balance examination

These instructions are to be read by the person administering the childSCAT3, and each balance task **should be demonstrated to the child**. The child should then be asked to copy what the examiner demonstrated.

Modified Balance Error Scoring System (BESS) testing⁵

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁵. A stopwatch or watch with a second hand is required for this testing.

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of two different parts."

(a) Double leg stance:

The first stance is standing with the feet together with hands on hips and with eyes closed. The child should try to maintain stability in that position for 20 seconds. You should inform the child that you will be counting the number of times the child moves out of this position. You should start timing when the child is set and the eyes are closed.

(b) Tandem stance:

Instruct the child to stand heel-to-toe with the non-dominant foot in the back. Weight should be evenly distributed across both feet. Again, the child should try to maintain stability for 20 seconds with hands on hips and eyes closed. You should inform the child that you will be counting the number of times the child moves out of this position. If the child stumbles out of this position, instruct him/her to open the eyes and return to the start position and continue balancing. You should start timing when the child is set and the eyes are closed.

Balance testing – types of errors - Parts (a) and (b)

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the child. The examiner will begin counting errors only after the child has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the two 20-second tests. The maximum total number of errors for any single condition is 10.** If a child commits multiple errors simultaneously, only one error is recorded but the child should quickly return to the testing position, and counting should resume once subject is set. Children who are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 2 stances can be performed on a surface of medium density foam (e.g., approximately 50cm x 40cm x 6cm).

Tandem Gait^{6,7}

Use a clock (with a second hand) or stopwatch to measure the time taken to complete this task. Instruction for the examiner – **Demonstrate the following to the child:**

*The child is instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. **A total of 4 trials are done and the best time is retained.** Children fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.*

Explain to the child that you will time how long it takes them to walk to the end of the line and back.

Coordination examination

Upper limb coordination

Finger-to-nose (FTN) task:

The tester should **demonstrate it to the child**.

"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Children fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
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4. McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sport Medicine. 2001; 11: 176–181.
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6. Schneiders, A.G., Sullivan, S.J., Gray, A., Hammond-Tooke, G., & McCrory, P. Normative values for 16-37 year old subjects for three clinical measures of motor performance used in the assessment of sports concussions. Journal of Science and Medicine in Sport. 2010; 13(2): 196–201.
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8. Ayr, L.K., Yeates, K.O., Taylor, H.G., & Brown, M. Dimensions of post-concussive symptoms in children with mild traumatic brain injuries. Journal of the International Neuropsychological Society. 2009; 15:19–30.

CHILD ATHLETE INFORMATION

Any child suspected of having a concussion should be removed from play, and then seek medical evaluation. The child must NOT return to play or sport on the same day as the suspected concussion.

Signs to watch for

Problems could arise over the first 24–48 hours. The child should not be left alone and must go to a hospital at once if they develop any of the following:

- New Headache, or Headache gets worse
- Persistent or increasing neck pain
- Becomes drowsy or can't be woken up
- Can not recognise people or places
- Has Nausea or Vomiting
- Behaves unusually, seems confused, or is irritable
- Has any seizures (arms and/or legs jerk uncontrollably)
- Has weakness, numbness or tingling (arms, legs or face)
- Is unsteady walking or standing
- Has slurred speech
- Has difficulty understanding speech or directions

Remember, it is better to be safe.

Always consult your doctor after a suspected concussion.

Return to school

Concussion may impact on the child's cognitive ability to learn at school. This must be considered, and medical clearance is required before the child may return to school. **It is reasonable for a child to miss a day or two of school after concussion, but extended absence is uncommon.** In some children, a graduated return to school program will need to be developed for the child. The child will progress through the return to school program provided that there is no worsening of symptoms. If any particular activity worsens symptoms, the child will abstain from that activity until it no longer causes symptom worsening. Use of computers and internet should follow a similar graduated program, provided that it does not worsen symptoms. This program should include communication between the parents, teachers, and health professionals and will vary from child to child. The return to school program should consider:

- Extra time to complete assignments/tests
- Quiet room to complete assignments/tests
- Avoidance of noisy areas such as cafeterias, assembly halls, sporting events, music class, shop class, etc
- Frequent breaks during class, homework, tests
- No more than one exam/day
- Shorter assignments
- Repetition/memory cues
- Use of peer helper/tutor
- Reassurance from teachers that student will be supported through recovery through accommodations, workload reduction, alternate forms of testing
- Later start times, half days, only certain classes

The child is not to return to play or sport until he/she has successfully returned to school/learning, without worsening of symptoms. Medical clearance should be given before return to play.

If there are any doubts, management should be referred to a qualified health practitioner, expert in the management of concussion in children.

Return to sport

There should be no return to play until the child has successfully returned to school/learning, without worsening of symptoms.

Children must not be returned to play the same day of injury.

When returning children to play, they should **medically cleared and then follow a stepwise supervised program**, with stages of progression.

For example:

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity	Physical and cognitive rest	Recovery
Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity, 70 % maximum predicted heart rate. No resistance training	Increase heart rate
Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey. May start progressive resistance training	Exercise, coordination, and cognitive load
Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
Return to play	Normal game play	

There should be approximately 24 hours (or longer) for each stage and the child should drop back to the previous asymptomatic level if any post-concussive symptoms recur. Resistance training should only be added in the later stages.

If the child is symptomatic for more than 10 days, then review by a health practitioner, expert in the management of concussion, is recommended.

Medical clearance should be given before return to play.

Notes:

CONCUSSION INJURY ADVICE FOR THE CHILD AND PARENTS / CARERS

(To be given to the **person monitoring** the concussed child)

This child has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the child will need monitoring for the next 24 hours by a responsible adult.

If you notice any change in behavior, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please call an ambulance to transport the child to hospital immediately.

Other important points:

- Following concussion, the child should rest for at least 24 hours.
- The child should avoid any computer, internet or electronic gaming activity if these activities make symptoms worse.
- The child should not be given any medications, including pain killers, unless prescribed by a medical practitioner.
- The child must not return to school until medically cleared.
- The child must not return to sport or play until medically cleared.

Patient's name _____

Date/time of injury _____

Date/time of medical review _____

Treating physician _____

Clinic phone number

Contact details or stamp

Pocket CONCUSSION RECOGNITION TOOL

To help identify concussion in children, youth and adults



RECOGNIZE & REMOVE

Concussion should be suspected **if one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

Loss of consciousness or responsiveness
Lying motionless on ground/Slow to get up
Unsteady on feet / Balance problems or falling over / Incoordination
Grabbing/Clutching of head
Dazed, blank or vacant look
Confused/Not aware of plays or events

2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs & symptoms may suggest a concussion:

- | | |
|--------------------------|----------------------------|
| - Loss of consciousness | - Headache |
| - Seizure or convulsion | - Dizziness |
| - Balance problems | - Confusion |
| - Nausea or vomiting | - Feeling slowed down |
| - Drowsiness | - "Pressure in head" |
| - More emotional | - Blurred vision |
| - Irritability | - Sensitivity to light |
| - Sadness | - Amnesia |
| - Fatigue or low energy | - Feeling like "in a fog" |
| - Nervous or anxious | - Neck Pain |
| - "Don't feel right" | - Sensitivity to noise |
| - Difficulty remembering | - Difficulty concentrating |

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3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

- "At what venue are we at today?"
"Which half is it now?"
"Who scored last in this game?"
"What team did you play last week / game?"
"Did your team win the last game?"

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

RED FLAGS

If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:

- | | |
|--|---------------------------------|
| - Athlete complains of neck pain | - Deteriorating conscious state |
| - Increasing confusion or irritability | - Severe or increasing headache |
| - Repeated vomiting | - Unusual behaviour change |
| - Seizure or convulsion | - Double vision |
| - Weakness or tingling/burning in arms or legs | |

Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to do so
- Do not remove helmet (if present) unless trained to do so.

from McCrory et. al, Consensus Statement on Concussion in Sport, Br J Sports Med 47 (5), 2013

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APPENDIX K

CTE IN FOOTBALL PLAYERS

Former CFL quarterback Matt Dunigans' career ended in August of 1996 when he sustained multiple blows to the head during his CFL game. Sustaining those concussions didn't just leave Matt seeing stars it lead to a hell hole that plagued him for months and still lingers to this day (Fish, 2012). The days following the concussions he looked fit and ready to dominate the game, but his head wasn't right. He couldn't complete a thought or a sentence (Fish, 2012). His personality turned angry and sour, so much that his wife was afraid of leaving him alone with the kids (Fish, 2012). "I couldn't put sentences together for the first two weeks," Dunigan says. "My lips were moving, but I wasn't digesting much information at all." "After 16 years, I am still running the gamut of post-concussion symptoms. That is something I continue to deal with. I don't use it as a crutch, It is just my opponent in today's world" (Fish, 2012).

"There are good days and bad days," Dunigan says, assessing his physical and mental status. "There are issues with equilibrium. There are headaches. It is mood swings. It is depression."

His wife suggests that concussions stole a part of his outgoing personality. The funny guy she fell in love with had turned very serious (Fish, 2012). Even today they live with the consequences of what happened on the football field three decades ago. "Everything is a struggle for him," she says. "He is more forgetful now, for sure. He'll tell me, 'I told you that. I showed you that.' And I am like, 'No you didn't.' He still has really bad headaches, but a lot of people do. I still think they are from the concussions because he didn't really have them before."

Jacob Bell surprised everyone when he walked away from NFL at the age of 31 (Unknown, 2012). He doesn't have any specific health concerns currently, but for him the decision to retire "was just quality of life" and a "risk vs. reward factor."

"I mean we have so much more to look forward to after we're done with football that you know to have something like the brain trauma and the CTE stuff is such a factor," he said. "For me it was a big consideration."

"I want to get out before the game makes me get out, where I can get out on my own term, and I can limit the amount of stress and negative impact that the game would leave on me."

Bell reported having three or four concussions that were documented in his career, but it's the head trauma that wasn't documented that also weighs on him (Unknown, 2012). "'Did you get a ding? Did you see stars? Did you feel hollow for a second? Did your vision go out?' Well if that's the case, then are we going to consider those as concussions as well, because if that's the case, I don't know about you guys, but we did that on probably every series, you'd feel something like that," Bell says. "So if that's a concussion, have we had three concussion, or have we had 100 concussions?"

APPENDIX L

RETURN-TO-LEARN FOR ADOLESCENTS AND CHILDREN

TABLE 1.

Return-to-Learn Plan

Stage	Activity	Objective
No activity	Complete cognitive rest — no school, no homework, no reading, no texting, no video games, no computer work.	Recovery
Gradual reintroduction of cognitive activity	Relax previous restrictions on activities and add back for short periods of time (5-15 minutes at a time).	Gradual controlled increase in subsymptom threshold cognitive activities.
Homework at home before school work at school	Homework in longer increments (20-30 minutes at a time).	Increase cognitive stamina by repetition of short periods of self-paced cognitive activity.
School re-entry	Part day of school after tolerating 1-2 cumulative hours of homework at home.	Re-entry into school with accommodations to permit controlled subsymptom threshold increase in cognitive load.
Gradual reintegration into school	Increase to full day of school.	Accommodations decrease as cognitive stamina improves.
Resumption of full cognitive workload	Introduce testing, catch up with essential work.	Full return to school; may commence Return-to-Play protocol (see Step 2 in Table 2).

Source: Master CL, Gioia GA, Leddy JJ, Grady MF